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14 APRIL 1986

China Report

ECONOMIC AFFAIRS

ENERGY: STATUS AND DEVELOPMENT--48

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CHINA REPORT

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CONTENTS

ERRATUM: In two reports, JPRS-CEA-86-012 of 5 February 1986 p 38, and JPRS-CEA-86-025 of 13 March 1986 p 52, article HONGSHI 500 MW UNIT, and HONGSHI'S FIRST 500 MW UNIT NOW GENERATING POWER, please change 500 MW to 50,000 kilowatts.

ERRATUM: In JPRS-CEA-86-012 of 5 February 1986 in BRIEFS on p 44 titled SECOND TONGLIAO UNIT OPERATIONAL please change 280,000 kW to read 800,000 kW.

NATIONAL POLICY

ISSUES IN RURAL POWER CONSTRUCTION DISCUSSED

Beijing ZIRAN BIANZHENGFA TONGXUN [JOURNAL OF DIALECTICS OF NATURE] in Chinese No 5, 10 Oct 85 pp 1-3

[Article by Xu Junzhang [5171 0193 4545], Institute of Energy Resources, the Chinese Academy of Sciences, State Economic Commission: "Several Issues To Be Noticed in the Construction of Rural Power"]

[Text] As rural productivity and living standard improve, especially in view of the fact that township and town industries expanded in recent years, rural energy demand will increase rapidly, and supply will be increasingly unable to meet demand. Therefore, we must develop rural energy sources. There are several issues in rural power construction that require our attention.

1. Unified Planning of Small Coal Mine Construction To Protect Resources

Local coal mines play an important role in coal production in China. In 1983, 350 million tons were produced, which is 49 percent of the national output. It is estimated that by the year 2000, output will reach 600 to 700 million tons, of which small-scale rural mines will produce approximately one-half. After many years of discussion it is clear that at the same time that we are constructing major coal bases, we will also develop medium and small-scale mines. In areas where coal resources are not abundant and inappropriate for constructing major coal mines, there is little contradiction in developing medium and small mines. Usually, mineral veins appear like chicken coops in these regions. Mines have no effects on each other. In major coal producing areas, however, this problem is more pronounced.

Mines excavated by farmers have one special feature. They begin to dig wherever the ores are exposed. After reaching a certain point when the technical conditions are no longer favorable, they will change the digging site. Very often there are dozens of small mines on a large coal field which makes it more difficult to construct large mines.

Resources are the wealth of a nation. As we exploit them, we should establish the concept of their protection. Hence, the development of large coal mines must require unified planning. Coal management departments should plan and decide which areas are suited for the construction of large mines to be excavated by the government and which areas are suited for medium and small mines to be exploited by towns and villages.

2. Paying Attention to Ecology in Developing Small Hydropower Plants

Construction of small-scale rural hydropower plants is also an item requiring unified planning. Very often small hydropower plants are built on tributaries. Thus, they are intimately related to the entire basin. There was actually a case in which a rural hydropower plant was built in a tributary upstream from a populated area to meet demands in production and daily living. This station, however, was located in the reservoir area of the trunk stream hydropower station under planning. Once the large plant is built, the small one will be flooded. Therefore, small rural stations must be constructed under the guidance of the plan for the basin.

More importantly, we must pay attention to ecological influences in developing small rural hydropower stations. For instance, the ground water levels upstream and downstream change because of the reservoir, which makes the soil sandy or more alkaline, and directly affects agriculture. Because of complex geological conditions in the reservoir regions, a serious leak may occur if it is in a limestone region or if faults exist to lose the water balance. Because of the construction of small hydropower stations, navigation of the river, growth of aquatic lives and even priority of water rights between power generation and agriculture and industry may be affected. If a branch water diversion type of rural power plant is made predominant, the problem mentioned is easier to resolve. However, a new problem arises: because such a station can only generate electricity seasonally, the supply of power cannot be assured. Therefore, water resources, ecology, environment and economics must be fully taken into account in building small rural hydropower stations.

3. Catching Up With Scientific Research Before Exploiting New Energy Resources

Throughout the world, studies are under way to find petroleum substitutes. Given China's situation, the countryside is the focus of efforts to develop new energy resources. After summarizing our experience in research and development, research is still the weaker link.

The use of methane has a long history. Many lessons have been learned from several rises and falls. One important lesson is that research and scientific popularization did not catch up. Over the years our government spent a lot of money on rural marsh gas, and most of it was on its promotion. The government substantially subsidized each rural family to build a pond. The expense on research, however, was very low. Despite the fact that technical people and methane research units did considerable work, however, most of the work remained at the marginal level.

Scientific research promotes competition and competition brings out high-level results. With good results, we can benefit from promotion. Thus, we will be able to overcome the problem of short-lived enthusiasm. Incidentally, in the past some work was initially done in China and was further improved abroad. The patents were then sold. This demonstrates the importance and economic value of improving our research work.

Improvement is not enough, we must also popularize. Popularization is also improvement for the end users. The technical level in rural China is low. To promote technical accomplishments in new energy resources to the rural communities we must first popularize science and technology to allow everyone to understand the principles so that we will be able to both use and manage it.

4. Addressing Economic Leverage in Exploiting Rural Energy Resources

Farmers are shrewd people. To attract rural investment in energy construction, the first question is its economic benefit. The energy produced is consumed in the countryside. Hence, the second question is price. These two issues are mutually related and constraining.

In order to gather rural capital to develop energy resources, we must bring them some benefit. How much benefit should there be? We believe that it should not be less than the long-term interest rate paid by the bank. For instance, farmers invest in a coal mine and the construction period is set at 2 years. It begins production in the third year and becomes profitable by the end of that year. Then, based on the interest rate for a 3-year fixed term deposit, it should not be less than 8 percent. It is more proper to pay 10 percent. This portion is directly paid to the investors from net profit which is a component of the investment return package.

To run a socialist business, not only should we maintain simple reproduction, but more importantly we should expand reproduction in order to create more social wealth. The capital for expansion mainly relies on the accumulation in the existing business. Therefore, the investment should also include the cumulative rate for expansion. The magnitude of cumulative rate determines the rate of expansion. It is proportional to the rate of growth. The faster the rate of growth is, the higher the cumulative rate becomes. For example, the growth rate for small rural coal mines is 4-5 percent in the next decade. Thus, the cumulative rate for expansion should not be less than 5 percent.

As productivity grows, employee benefits also increase. Better working and living conditions can be created to further motivate enthusiasm. Employee benefits come from profits, and both are linearly proportional. An unprofitable business cannot afford any employee benefits. If 2-3 percent of the investment is spent on benefits, then 200,000-300,000 yuan can be spent if 10 million yuan are invested in production.

In summary, the economic benefit of the investment, or the rate of return, should not be less than 18 percent; i.e.:

$$\text{Rate of return} = \frac{\text{net profit}}{\text{total investment}} = \frac{\text{total income} - (\text{production cost} + \text{tax})}{\text{total investment}} \geq 18\%$$

From the equation we can see that the rate of return is determined by three factors: investment to produce a ton of coal, cost to produce a ton of coal and market price of coal. Since the tax is fixed by the government, the higher the investment, the higher the production cost will be, and correspondingly, the higher the cost of coal will be. To further illustrate this issue,

let us calculate the investment, cost and price for a ton of coal by assuming that the guaranteed return is 18 percent and tax is 50 percent of the total income. We have the following approximate relation (in unit of yuan/ton):

Investment/ton	50	60	70	80	90	100
Cost/ton	15.5	17.5	19.5	21.5	23.5	25.5
Price/ton	26	30	34	38	42	46

The price of coal is principally determined by the production cost. It also depends on the market demand. Coal prices are generally low; and coal is not very profitable which is one factor affecting the development of coal. If the price of coal is increased, then the costs of other products must also be affected which directly involves the right of the consumer. Therefore, it is a complicated problem. Research into the pricing of coal should also be included in the national pricing structure to arrive at a rational arrangement.

5. Strengthening Comprehensive Scientific Research for Rural Power Construction

Rural power is a complex socioeconomic problem. To meet the energy demand in rural China, we must primarily rely on developing local resources. The exploitation of these resources must involve various sciences and technologies, natural conditions and socioeconomics. Therefore, rural energy problems cannot be solved by a single discipline alone. We must link socioeconomics, natural conditions and science and technology and conduct comprehensive investigations to obtain satisfactory results.

Such studies have made significant progress since the 1950's. It has become an important trend in scientific development. It is a frontier science based on traditional scientific progress and is also called an interdisciplinary science which mixes sociology, natural science and technology in the process of solving a major social problem. It is not a pure natural science or technology nor is it sociology. Since the 1970's, with the development in science and technology, the wide use of control theory, information theory, systems theory and computer technology brought brand-new dimensions to such studies. Comprehensive energy research is very weak in China. Its importance has already been recognized. Only by conducting such studies can energy problems in China, including rural energy problems, be effectively solved.

12553/6091
CSO: 4013/41

1986 POWER GENERATION PLANS DETAILED

HK110423 Beijing CHINA DAILY in English 11 Mar 86 p 1

[Article by staff reporter Xu Yuanchao]

[Text] In a bid to ease China's shortage of electricity, the power industry expects to increase its output by 22.7 billion kilowatt hours (kWh), or 5.6 percent, to reach a total of 430 billion kWh, this year.

Hydropower stations will produce 88 billion kWh, a drop of 3.3 percent. Thermal power plants will produce 342 billion, an increase of 8.13 percent, the Ministry of Water Resources and Electric Power reports.

The industry will put at least 5 million kilowatts of new generating capacity into operation, with another half million possible. Construction of 18 power projects is scheduled to begin this year, the ministry said.

About 40 large and medium-sized generators will begin producing this year, four of them in the Gezhouba hydropower station being built on the Huang He.

The ministry said that construction of six generators may be completed in the first half of the year; most will be completed by the year's end.

Although the State has authorized an investment of 10.2 billion yuan ($3.2 billion) to be raised through various channels, the industry is still facing a shortage of funds. According to ministry estimates, at least another 3 billion yuan ($938 million) to fulfill this year's "arduous task."

The ministry warned that the chronic power shortage has spread from coastal areas to inland provinces. The industry has to curtail electricity use in some areas, especially in the Northeast, Central and East China, to make power available where it is most needed.

/7358
CSO: 4010/40

CHRONIC POWER SHORTAGE EXPECTED TO CONTINUE FOR YEARS

HK030243 Beijing CHINA DAILY in English 3 Mar 86 p 1

[Article by Xu Yuanchao]

[Text] China's power industry has set a target of generating 550 billion kilowatt-hours of electricity a year by 1990, but the country will not be able to overcome its chronic power shortage during the current 5-year plan.

China's generating capacity reached 86 million kilowatts last year, representing an average annual increase of 5.5 percent during the Sixth Five-Year Plan. Of the total capacity, 26 million kilowatts came from hydroelectric power stations, Zhao Qinfu, deputy minister of Water Resources and Electric Power, told a week-long ministry conference, which ended in Beijing yesterday.

During the current 5-year plan, China will add 34 million kilowatts to the nation's power generating capacity compared to the 20 million kilowatts added during the last 5-year plan, he said. Each kilowatt of capacity can produce up to 8,700 kilowatt-hours of electricity per year.

A number of thermal power plants with a total capacity of 26 million kilowatts are planned in the major coal-producing provinces of Shanxi, Heilongjiang, Henan, Shaanxi, Shandong, Anhui, and Guizhou as well as the Inner Mongolian and Ningxia Hui autonomous regions.

Some plants will be built near harbors to ease the power shortage in coastal areas. In the meantime, several power plants are planned to supply areas of peak demand.

In the next 5 years, the industry will put 7.4 million kilowatts of hydroelectric generating capacity into production. Priority will be given to the construction of large hydroelectric power stations on the upper reaches of the [Huang He] upper and middle reaches of the [Chang Jiang] and the Hongshui [He] valley. The ministry will help local authorities develop medium-sized and small hydroelectric stations.

The first stage of the Qinshan Nuclear Power Plant in Zhejiang Province is scheduled to be completed by 1989 and will have a capacity of 300 megawatts. Construction of the 1,800 megawatt Daya Bay Nuclear Plant in Guangdong Province will continue during the 5-year period.

Several 500 kV transmission lines with a total length of 3,539 kilometers will be build to connect five of the country's seven electric power grids, Zhao said.

Funds for the projects have been raised locally since 1981, when Shanghai called on local governments to use their money for power construction.

Local funding increased to 730 million yuan last year from 173 million in 1984. Zhao said the industry would raise 10.7 billion yuan from local areas during the current 5-year plan, to be used for 50 power projects with a total capacity of 10 million kilowatts.

"We just get a clear understanding of the situation that the power industry cannot keep pace with the growth of the national economy," Zhao said.

In 1987, China was estimated to have been short of 40 billion kilowatt-hours of electricity a year. Last year the ministry said the power shortage had risen to between 45 to 50 billion kilowatt-hours.

Zhao said that the power industry would increase its annual generating capacity and make every effort to beat the state target and produce 600 billion kilowatt-hours a year by 1990. In addition, he called the industry to save power and adopt energy-efficient measures.

/12929
CSO: 4010/39

POWER INDUSTRY CONSOLIDATES GRID STRUCTURE

OW041411 Beijing XINHUA Domestic Service in Chinese 0303 GMT 3 Mar 86

[Article by reporter Wang Yanrong]

[Text] Beijing, 3 Mar (XINHUA)--According to the national meeting of directors of power grids and provincial bureaus, during the Sixth Five-Year Plan, China's power industry entered a new phase of development, characterized by bigger generating sets, extra-high voltage, and larger power grids.

This reporter was told that power production, based mainly on generating sets with a capacity of 200,000, 300,000 or 600,000 kW, extra-high voltage power transmission, and the formation of large, unified national power grids, combining the various provincial systems, gave better play to the efficiency of generating sets, facilitate power transmission, reduce the loss of electricity during transmission, and make flexible the transfer of electricity. The hallmarks of the new phase are:

--By the end of 1985, the nation's total generating capacity reached 86 million kW. Half of the 60 million kW thermal power capacity came from sets with a capacity of 100,000 kW or more. Giant generating sets, each with a capacity of 600,000 kW, have been put into operation at Yuanbaoshan Power Plant. The installed capacity of the four newly completed power stations--Qinghe, Jianbi, Douhe, and Liujiaxia--all exceed 1 million kW.

--Completion of 2,570 km of 500 kV extra-high voltage power transmission lines; the three major power grids of central China, north China, and east China began to use 500 kV power grid skeletons; construction began comprehensively on the Shanghai-Gezhouba section of China's first 500 kV extra-high tension direct current power transmission project.

--Eight projects to link grid systems progressed rapidly. The grid system in eastern and western Heilongjiang was linked with the principal power grid in the northeast; the grid of Shanxi and southern Henan was linked with the Beijing-Tianjin-Tangshan grid to form a unified north China power grid; the power grids of Hunan, Hubei, Jiangxi, and Henan were linked to form a unified central China grid system; the northwest power grid was linked with Henan, Sichuan, and Ningxia; Sichuan linked with Guizhou; and Guangdong linked with Guangxi. The linkup increases the installed capacity of the four transprovincial power grids in northwest, north, east, and central China to more than 12 million kW. The capacity of the power grids in northwest and southwest China also exceeds 5 million kW.

/7358
CSO: 4013/92

NINGXIA-GANSU POWER GRID LINKING PROJECT COMPLETED

Yinchuan NINGXIA RIBAO in Chinese 16 Nov 85 p 1

[Excerpts] An important construction project of the Ningxia Autonomous Region--the connection of the power grids of Ningxia and Gansu (the installation of 330 kV lines)--was completed and formally put into operation at 3:26pm, 12 November 1985. Thus ended the long isolation of this region's power network. The connection combines the networks of the four provinces and regions--Shaanxi, Gansu, Qinghai, and Ningxia--into one that can be regulated to offset the surplus and shortage of power among the individual grids. The Ningxia-Gansu grid-linking project includes the construction of the new Qingtongxia substation, which is connected to the Jingyuan substation, a terminal of the Gansu grid, through 230 kilometers of high-voltage (330 kV) line. The 146-kilometer line between the Jingyuan substation of Gansu and Gucheng Township, Zhongning County, Ningxia, was erected by the Gansu Bureau of Electric Power Industry. The section between Gucheng Township and the Qingtongxia substation was erected by the Ningxia Office of Power Transmission Engineering. The buildings of the Qingtongxia substation were constructed by the Dongfengxiang Construction Company of Wuzhong and the equipment was installed by the Qingtongxia Power Bureau's Office of Installation Engineering. The Ningxia Office of Power Transmission Engineering completed the installation of its assigned section last year. The Dongfengxiang Construction Company started construction this March, and by July a majority of the completed structures was ready for installation. A major piece of equipment of the substation, the No 2 transformer, weighs 200 tons and could only be unloaded at the Qingtongxia Chemical Fertilizer Plant, 2.5 kilometers from the substation. Placing railroad ties under the transformer, workers from the Qingtongxia Power Bureau's Office of Installation Engineering moved it forward inch by inch with human power alone. It took only 10 days to put this equipment in place. There was a shortage of manpower at the crucial juncture of the substation's second wiring and equipment testing. The technical personnel from the Central Dispatcher's Office of the Regional Power Bureau, the Yinnan Power Distribution Bureau, the Zhongning power plant, the Shizuishan power plant, and the Wuda Power Plant of Inner Mongolia responded to the call for help and gave their full cooperation to guarantee the success of the connection.

12922/12624
CSO: 4013/55

RAPID DEVELOPMENT OF NINGXIA POWER INDUSTRY DETAILED

Yinchuan NINGXIA RIBAO in Chinese 3 Dec 85 p 1

[Article by Zhao Jingquan [6392 2529 3123]: "Rapid Development Made by Ningxia Power Industry in Sixth Five-Year Plan"]

[Text] During the Sixth Five-Year Plan, the power industry administration of Ningxia and the enterprises under its jurisdiction accelerated the pace of capital construction and engineering construction of complete projects, and increased the output by tapping its own potential. From 1981 to the end of October 1985, the Ningxia power industry produced a total of 10.8 billion kWh without increasing the power generation facility. Compared to the Fifth Five-Year Plan, the increase is 31 percent, or 4.28 percent per year.

To meet the increasing demand of electric power in the development of industrial and agricultural production and residential power consumption during the Sixth Five-Year Plan, the power industry departments in Ningxia as well as every power enterprise made the necessary adjustments and strived to increase power production every way they could. In the flood season of 1984 the low-water level in the Huang He limited the power output, but the Qingtongxia power station generated 100 million kWh more electric power than the same period in 1983 by keeping its equipment in good operating condition and by careful coordination with the operation of the power grid. This year [1985] the water level has been even lower and for a longer period of time. The output of the power grid could not meet the needs of the entire region. As a remedy, the Electric Power Administration of the Ningxia Autonomous Region quickly organized thermal power plants to increase production and compensate for the drop in hydropower output. The power plant at Shizhuishan alone generated 100 million kWh more than its 1984 production level.

During the Sixth Five-Year Plan, the People's Government of the autonomous region, with the support of the Ministry of Water Resources and Electric Power, gave high priority to power generation, transmission, and substation construction and allocated funding and materials. Statistics showed that a total of more than 240 million yuan have been invested in the capital construction for power generation from 1981 to the present, equivalent to the sum of all investments made on power production during the Fourth Five-Year Plan and the Fifth Five-Year Plan. Because of the expanded production, the power grid structure has undergone obvious changes. The transmission line voltage has been increased from the 110 kV in the Fifth Five-Year Plan to the present 220 kV, the substation capacity has been increased by 604,000 kVA, 146 kilometers of 330 kV high-voltage transmission lines have been constructed, links were made to the Shaanxi-Gansu-Qinghai power grid and, for the first time in 30 years, the Ningxia power grid is no longer isolated.

Rapid progress was also made in the Sixth Five-Year Plan period in the rural power industry. Within 5 years, the 110 kV and 35 kV high-voltage transmission network and the 10 kV and 6 kV distribution network have grown by 1,339 kilometers. The extensive transmission network has broadened the scope of power supply. In the Fifth Five-Year Plan, about 50 percent of the farming households were supplied with electricity; it has now increased to more than 60 percent. Electricity used in agriculture has accumulated to a level of 1.225 billion kWh, 71 percent higher than the level of the Fifth Five-Year Plan. In the southern mountainous region, the construction of the Guhai, Zhongwei, Nanshan, Taizi, and Yanghuang projects, with a capacity of 84,000 kW, has changed 140,000 mu of arid land into irrigated land.

9698/13045
CSO: 4014/53

POWER NETWORK

ANHUI'S EXPANSION PLANS FOR 7TH FYP OUTLINED

Hefei ANHUI RIBAO in Chinese 24 Feb 86 p 2

[Text] Authorities of the provincial power departments have revealed that during the Seventh Five-Year Plan, the Anhui power industry will accelerate the pace of construction with plans to increase the installed capacity of thermal power plants by 2 million kilowatts, 1.86 times the increase in the Sixth FYP.

Anhui's ample coal resources provide an excellent situation for the growth of the electric power industry. In the Seventh Five-Year Plan, Anhui will build or expand a number of thermal power plants, installing seven steam generators with a total generating capacity of 2 million kilowatts. The No. 2 300MW unit of the first stage of the Huainan Luohe power plant, now under construction, and a 125,000 kW unit of the province's first pooled-resources project -- the Hefei power plant expansion project -- could be operational in 1986. The two 600MW units of the first stage project of the Huainan Pingyu power plant, on which construction has already begun, are scheduled to go into production in 1987 and 1989 respectively. Three 125,000 kW generator sets of the Tongling and Ma'anshan power plant expansion projects-- state-approved projects funded by Anhui Province--are to go on stream in the period of the Seventh Five-Year Plan. In addition, construction on the Huaibei No. 2 Power Plant and the Maozishan power plant located at Ma'anshan is scheduled to begin during the same period.

In order to transmit this electricity from the Huanan power base to Shanghai and other places in eastern China, a 240-kilometer-long 500kV ultra high-tension transmission line that has been erected between Luohe and Fanchang will go from the 220 kV present stage to its full capacity this year. Concurrently, an effort will be made to put the province's first 500 kV large-scale transformer station (the Fanchang station) into service in 1986. The 500 kV transmission from Fanchang to Pingyao in Zhejiang is under accelerated construction. Work on the Huainan Pingyu-Fanchang-Jianbi (in Jiangsu) 500 kV ultra high-tension line and the Feixi 500 kV transformer station will also commence in the Seventh Five-Year Plan. Finally, the 500 kV transmission-transformer project from Pingyu to Luohe and the Huaibei No. 2 Power Plant to Luohe via Bengbu is also slated for construction.

CSO: 4013/96

POWER NETWORK

AUTOMATED CONTROL SYSTEM FOR SOUTHWEST GRID CERTIFIED

Chengdu SICHUAN RIBAO in Chinese 22 Nov 85 p 1

[Article by Zhao Jian [6392 1017]: "Automated Control System for Southwest Power Grid Passes Certification"]

[Text] An automated control system for the southwest power grid--one of China's high priority development projects--passed certification on 16 November in Chengdu.

The southwest power grid of more than 2 million kilowatts controlled by the southwest main control has a direct impact on the economy of Sichuan. In the past, since the operation of the various power plants and substations was directed by personnel in the main control station via telephone, the controllers did not have real-time access to change and incidents in the power grid. As a result, delays in the communication often led to extensive blackout and caused severe losses in agricultural and industrial production. In 1981 the Nanjing Institute of Automation and the Southwest Electric Power Administration under the Ministry of Water Resources and Electric Power made a joint effort to automate the control of the southwest power grid. After several years of hard work, the first phase of the automation project has been completed for this important power grid.

In the main control room, the operator simply pushes one button to see a color display in Chinese of the operating conditions of the southwest power grid throughout Sichuan and in parts of Gansu and Guizhou. In case of an incident, the location of the power plant involved and conditions of the malfunction will be automatically shown on the screen and a flashing light warning signal will be given. Based on the displayed information, the operator will be able to diagnose the event in one minute or less. Chief of the Control Section Qu Muhan [1448 1970 7281] told this reporter that they will be able to stay on top of the power supply situation and make necessary adjustments during this year's winter low-water season. The reporter was also told that the second phase of the southwest power grid automation project is under active preparation.

9698/13045
CSO: 4013/54

POWER NETWORK

HUAINAN COAL FIELDS BECOMING BIG POWER CENTER

OW280830 Beijing XINHUA in English 0816 GMT 28 Feb 86

[Text] Hefei, 28 February (XINHUA)--The Huainan coal field in Anhui Province will become the biggest power generating center in the Shanghai Economic Zone by the year 2000, the provincial Power Industry Bureau said here today.

By then, Huainan will supply about 30 billion kWh of electricity a year to the zone, which covers the municipality of Shanghai and the provinces of Anhui, Jiangsu, Jiangxi, and Zhejiang.

Although it accounts for roughly 5 percent of the country's land mass, the zone creates a quarter of China's national income and electricity shortages are considered a hindrance to further economic growth.

Two coal-fired power plants, Luohe and Pingwei, with a combined generating capacity of 3.6 million kW, are being built in Huainan. When completed by 2000, the two plants will bring Huainan's generating capacity to 4.2 million kW.

Last year, Huainan produced 10 million tons of coal and 7 billion kWh of electricity.

Construction of thermal power plants near coal mines is a measure being taken by the Chinese Government to ease strains on railway transportation.

/12232
CSO: 4010/37

POWER NETWORK

HEILONGJIANG'S 7TH FYP GOALS OUTLINED

SK120920 Harbin Heilongjiang Provincial Service in Mandarin 1000 GMT 11 Mar 86

[Text] During the Seventh Five-Year Plan, our province will create a new upsurge in power construction. According to preliminary calculations, total investment will exceed 3 billion yuan, nearly three times the total investment in power construction in the Sixth Five-Year Plan. The newly added power generating capacity will be 2.425 million kilowatts, twice that of the Sixth Five-Year Plan. New ultra-high-tension power transmission lines of 220 kV or more will reach 2,000 km, 1.3 times that of the Sixth Five-Year Plan.

Major characteristics in the province's power construction during the Seventh Five-Year Plan are as follows:

1. The number of projects will be large. There will be 13 power generating projects. Projects to be completed and go into operation include the first-phase project of the Harbin No. 3 power plant, the second-phase project of the Fularji No. 2 power plant, reconstruction of the Harbin power plant, expansion of Liangzihe and Jiamusi power plants, the first-phase project of the Shuangyashan power plant, expansion of the Fularji thermal power plant, the third-phase project of the Mudanjiang No. 2 power plant, and the power station of the ethylene plant. Projects to be started in the Seventh Five-Year Plan and completed and put into operation in the Eighth Five-Year Plan include the second-phase project of the Harbin No. 3 power plant, the second-phase project of the Shuangyashan power plant, expansion of the Harbin thermal power plant, and the new Mishan power plant. The total capacity will exceed 3 million kilowatts. In addition to the power-generating projects, there will be 17 supplementary power transmission and transformation projects. In this way, during the Seventh Five-Year Plan, 30 power projects, from the Fulaerji power plant in the west to the Shuangyashan power plant in the east, will be under construction.

2. There will be many large power-generating sets. Among the new power generating capacity of more than 2.4 million kilowatts of the Seventh Five-Year Plan, more than 86 percent will be created by large equipment with a capacity of 100,000 kilowatts or more per unit. The number of large power-generating units with a capacity of 200,000 kilowatts each will reach 9, more than 2 times that of the 200,000-kilowatt power generating units which are in operation in the province at present. Among the power-generating

projects to be started in the Seventh Five-Year Plan and completed and put into operation in the Eighth Five-Year Plan, there will be four large power-generating units with a capacity of 600,000 kilowatts each.

3. A unified power grid will be established in the province. At present a 200 kV (Hadong) substation is under construction and installation, and will be completed and put into operation this year. After its operation, the two power networks in both east and west parts of our province will be connected, thus putting to an end the many years of separate operation of these two networks. Unified command and management will be exercised to improve the province's power supply capacity and reliability.

If the power construction tasks for the Seventh Five-Year Plan can all be fulfilled, the province's power shortage will be basically alleviated by the year 1990.

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MAJOR ADVANCE REPORTED IN YUNNAN POWER INDUSTRY

Kunming YUNNAN RIBAO in Chinese 23 Jan 86 p 1

[Article by Liu Ruiping [0491 3843 1627]: "Yunnan Power Industry Took Big Strides During Sixth Five-Year Plan"]

[Text] Yunnan's power industry has made rapid progress since the Third Plenum of the 11th CPC Central Committee, laying a solid energy foundation for the province's industrial and agricultural production.

During the Sixth Five-Year Plan, the installed capacity of the power industry went up 19.66 percent over the Fifth Five-Year Plan; electric energy production, up 31.38 percent; and total transformation capacity, up 14.86 percent. A power transmission network is now in place, consisting of 3,751.15 kilometers of transmission line of 35 kV and more. Radiating from Kunming, it reaches the Huangni He (in Luoping) in the east, the Xier He (in Dali) in the west, the Lushui He (in Gejiu) in the south, and the Yili He (in Huize) in the north. The fact that it is also connected to transmission networks in Guizhou and Sichuan makes possible power exchange and mutual regulation among these provinces. Yunnan is richly endowed with water resources and is thickly dotted with small hydropower stations. In addition to the major transmission network, the total installed capacity of small hydropower stations is 553,900 kW, up 30.79 percent over the Fifth Five-Year Plan period. Today, almost every county in the province is supplied with electricity. According to incomplete data, 44 counties have "replaced firewood with electricity" to some extent. The electrification of the kitchen has done much to bring prosperity to the rural economy.

In the wake of scientific and technical advances, the power industry in Yunnan is gradually moving in the direction of high-parameter, large-capacity generating sets. With an installed capacity of 600,000 kW, the Xiaolongtan power plant is the largest pit-mouth plant in the province. During phase one of the project, the first 100,000-kW generating unit was successfully put through an 72-hour trial operation on 18 December 1985 and has now formally gone into production. A complementary facility, a 152-kilometer transmission line of 220 kV, was put into service at the same time to carry a large supply of electricity to Kunming, the electricity consumption center. After more

than a year's frantic work, the river was successfully dammed at Dabaweiyanhelong on 15 November 1985 as planned for the construction of the Lubuge hydropower station, which will have an installed capacity of 600,000 kW. The Manwan hydropower station, with a projected installed capacity of 1.5 million kW, has been designated by the state as a priority project under the Seventh Five-Year Plan and is the first joint venture between Yunnan Province and the Ministry of Water Resources and Electric Power. Construction is also under way at two complementary projects, the Manwan transformer station and a 121-kilometer transmission line. Tenders are now being invited nationally for the construction of the project proper and the excavation of the flood discharge tunnel and the diversion tunnel. With an installed capacity of 200,000 kW, the Pupingcun power plant is being remodelled to make it more energy-efficient. Its first 100,000-kW generating unit is scheduled for completion and operation in 1987. The Xier He third cascade power station is now under construction and will have an installed capacity of 50,000 kW.

As the power industry develops, the technical and managerial standard of the province's power supply system has been improving steadily. Scientific research and technical innovation of a popular character are flourishing. During the Sixth Five-Year Plan, 73 research projects won scientific achievement awards from the Ministry of Water Resources and Electric Power, Yunnan Province, the Southwest Power Network Bureau and the provincial Bureau of Electric Power. The development of these activities has effectively promoted safe and economical electricity generation and supply.

12581/8309
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POWER NETWORK

BRIEFS

JIANGXI 220 KV LINE--A section of the 220 KV high tension power transmission line between Zhushan and Dunhou began operation on 26 January. This is part of the Wanan hydropower station, a key state construction project. The 86-km line, which goes through Xinyu, Xiajiang, Jishui, and Ji'an, was completed in only 10 months. [Summary] [Nanchang Jiangxi Provincial Service in Mandarin 1100 GMT 1 Feb 86 OW]

1985 FIGURES REVISED UPWARDS-- According to the 1986 Conference of National and Provincial Power Chiefs held recently in Beijing, China's actual power output in 1985 was 408.5 billion kWh, fifth highest in the world. During the Sixth Five-Year Plan, basic electric power construction exceeded the plan, and actual newly-installed capacity totalled 20.42 million kW. Of this, 5.548 million kW was from large and medium-sized projects that went on line in 1985, the most ever in any one year. By the end of 1985, China's total installed capacity was 86.29 million kW. [Text] [Beijing RENMIN RIBAO (OVERSEAS EDITION) in Chinese 27 Feb 86 p 1]

CSO: 4013/92

'REEVALUATING HYDROELECTRIC ECONOMY' THROUGH METHODOLOGY

Beijing SHUILI FADIAN [WATER POWER] in Chinese No 10, 12 Oct 85 pp 7-11

[Article by Weng Changpu [5040 7022 3302], chief engineer, Guangxi Zhuang Autonomous Region Planning Commission: "Using Methodology To 'Reevaluate the Economy of Hydropower'"]

[Text] The Investment Survey Department and Investment Research Institute of the Chinese People's Construction Bank published the article "A Reevaluation of the Economy of Hydroelectric Power" (referred to hereafter as the "Reevaluation") in a special issue (1) of TOUZI XINXI [INVESTMENT NEWS] on 10 February 1985. This article was based on research and public discussion of electric power investment policies by financial circles and is very welcome. The article penetratingly described the "time value of capital" and is very deserving of serious consideration by us comrades involved in hydropower. It is, however, difficult for comrades in financial circles to avoid limitations when studying development principles and investment directions in a particular industry. The common conclusions suggested for hydropower do not conform to reality and I beg to differ. My article will not discuss problems in actual accounting but will offer some views concerning the ideas and methods in the "Reevaluation."

I. The Method of Examining Historical Experiences

Modern policymaking focuses on data, but the data used in drawing conclusions should conform to real situations. The "Reevaluation" does not fit this condition. Today, with highly developed electronic computers, data calculations are an important basis for policy decisions, but they are not the only basis. Policy decisions often are determined through consideration of many areas by policymakers and the broad knowledge and rich experience of the policymakers play a guiding role. The method of proof for many complex questions is based on historical practice and experience. This method still has not outlived its usefulness and a belief in the knowledge of predecessors and pioneers is essential if we are to be able to enrich our knowledge.

1. A comparison of hydropower and thermal power shows that rather large investments are needed for hydropower itself (if we consider comprehensive investments, they basically are the same). The cost of electricity is lower, however, so the overall economic results are higher. This is the general

view concerning hydropower. It is for precisely this reason that during the development of energy resources and electric power, the developed nations of the world first of all have developed hydropower, and the degree of hydropower resource development already is very high. What is the situation in China? When calculated according to the amount of power, hydropower development in China to date is less than 5 percent of the amount that could be developed. The development of hydropower has just begun. The author of the "Reevaluation" actually wishes to "cut out one-half the investments in hydropower" to "develop thermal power." This completely ignores world experiences in the development of energy resources and also is damaging to the development of electric power in China. This is not a method of examining historical experiences. The "Reevaluation" states that "interest rates on credit in international financial markets now are rising to a very substantial degree. The time value of capital now is not just a concept of the 1950's and 1960's." This is a fact. We must acknowledge, however, the status of the World Bank in the areas of financial knowledge and technical economics knowledge. The World Bank has expressed interest in electric power construction, especially in the area of hydropower. The first discussions have been completed and the Lubuge hydropower station on the Huangni He in the upper reaches of the Hongshui He now is under construction. I was a direct participant in preliminary work on this project. After an initial examination of some hydropower project sites in China, the advanced experts and advisers from the World Bank took the initiative in telling me that "China has so many good hydropower resources and they remain so far from being developed. Why are you so busy building so many thermal power plants?" After leading a delegation to China to visit the Hongshui He, Freeman, who was energy adviser to the former President of the United States and former director of the Tennessee Valley Authority, gave a speech at Nanning. He did not understand why we did not build the Longtan hydropower station first. It should be noted that Freeman is not a member of a "hydropower clique." The TVA is good at planning power networks and Freeman was energy adviser to the President, so he should have a thorough understanding of finances. Shouldn't we pay attention to the views of these experts concerning electric power construction in China at present since they have such rich practical experience and broad knowledge?

As I mentioned previously, less than 5 percent of China's hydropower resources have been developed, so there is very substantial leeway in selecting the best. It should be noted that each hydropower station site has different natural conditions and geographical locations. Their economy also varies considerably and the difference is very substantial for some. The selection of programs and construction sequences for hydropower projects involves strategic programs and major relationships, so scientific discussion in all areas is needed. Financial circles have a large and ample scope of abilities. To abandon this and generally discuss whether or not the superiority of hydropower is passe is to miss the target.

2. The problems we have discussed will have effects through the end of this century and into the next. The results of discussions today must be examined in terms of their influences on future development trends.

3. Current price structures in China are irrational. The losses from coal (especially in the south), for instance, have created the false impression that thermal power is profitable. As reforms in economic systems become more intensive, this situation will change and the economy of hydropower will become increasingly apparent.

The alleviation in the world energy crisis is only temporary, since the overall trend cannot be reversed. The reason is that conventional mineral fuels as a whole are seeing the shrinking of rich coal and an increasing trend toward lean coal and demand for energy resources continues to grow. When the price of energy resources rose a few years ago, several "bones" left over in some developed nations from hydropower energy resources that in the past were viewed as having no economic value for development now have been recognized as having economic value. This sort of situation will appear continuously in future development.

The "Reevaluation" states that "interest rates on credit in international financial markets now are rising to a very substantial degree." Why? What will be the situation in the future? The author does not know and only makes a few general statements. The high interest rates on long-term credit are set in consideration of monetary devaluation when the loan is repaid. Interest rates generally are restricted by the relationship between capital supply and demand. Financiers with enormous strength and farsightedness do not pursue overly high interest rates for long-term credit with no risk. None of the interest rates on loans for hydropower stations that the author has come into contact with are as high as those used in the "Reevaluation."

When studying a question of such importance as energy resource policies, detachment from the ideological method of examining historical experience, a failure to do scientific analysis and mere reliance on certain incorrect numerical operations make it impossible to avoid deriving incorrect conclusions.

II. The Method of Comprehensive Analysis

Comparisons of the economy of hydropower plants and thermal power plants already are rather complex. If, however, we wish to discuss the comprehensive economy of hydropower versus thermal power, we are even less able to rely on the single index of the time period of investment repayment. We must carry out comprehensive analysis. The "Reevaluation" does not employ this ideological method.

1. Hydropower stations involve the joint completion of primary energy resource and secondary energy resource development. Thermal power plants convert primary energy resources into secondary energy resources. Research on electric power development principles in China with its vast territory requires attention to the fact that the development of thermal power cannot be detached from the opening of new coal mines and communications construction, but it relies abstractly on commodity coal. Like hydropower energy resources, coal energy resources vary greatly in economy because of differences in natural conditions. Practice in energy resources in Guangxi during

the 1970's provides an example. Guangxi placed its energy resources hopes in the Hongshui He, which was proposed after summarization of the "mass campaign of contention for coal."

Generally speaking, the reliability of coal mine construction in southern regions with their complex geological and hydrogeological conditions is less than for hydropower construction. One thing is that the accuracy of reliability of reserves is poor. The second is that the reliability of attaining forecasted results for mine construction is poor. In a somewhat longer term view, it is hard for coal mine construction to sustain stable growth in productive capacity of energy resources. The reason is that almost every year some old coal mines become worthless because extraction ends. As the overall scale of coal mine construction expands and extraction intensifies, it will be hard to sustain original coal output capacity over a specific period of time. Hydropower is a renewable energy resource and does not have this problem. In addition, the construction period for coal mines certainly is not short. The No 6 generator at the Heshan power plant in Guangxi can serve as an example. It took only 1 year to construct but 10 years passed before the matching Shicun shaft at the Heshan coal mine was built. Moreover, the production capacity actually formed could satisfy only one-fifth the coal requirements of the No 6 generator and it was flooded because of excessive water surges. This example, of course, is not representative of China as a whole, but it is not the only or the worst example in southern areas in Guangxi. The Liupanshui coal field in Guizhou is another example. It had excellent coal quality and preservation conditions for the south and for China as a whole. The state expended a great deal of effort over more than 20 years, but the yearly coal production capacity was only 6 million tons. It used high efficiency thermal power generators but was incapable of generating the 18.3 billion kWh of electric power that the Longtan hydropower station on the Hongshui He can generate each year. If we add in the 6.2 billion kWh of electric power generated each year in upstream and downstream cascades, the total yearly electric power output at the Longtan hydropower station is 24.5 billion kWh. The Longtan hydropower station, however, also took 10 years to build.

The discussion above is not directed at coal mine construction. Instead, it is concerned with the long-term tendency of some people to confuse energy resource development with energy resource conversion and to use only the hydropower and thermal power stations themselves as a basis for comparing investments and construction periods.

2. The economy of power plants should be included in examinations of power networks. This is a specialized question and will not be covered in detail in this article. It must be pointed out, however, that the "Reevaluation" refers to "low equipment utilization time" and "substantial losses in redundant capacity" at hydropower stations. Idleness of thermal power generators during the rainy season and idleness of hydropower generators during the dry season are treated as "redundant capacity," and so on. All of these are superficial statements based on half-baked knowledge and are not worthy of repetition.

It must be noted that the utilization time of equipment is not a peculiarity of hydropower or thermal power plants. It is instead a technical economic decision by design personnel based on system conditions. In electric power systems with a rather high proportion of hydropower, the author has advocated for a long time that it is best if the utilization time of hydropower equipment is no less than 5,000 hours, as is the case in the Hongshui He and the Lancan Jiang projects. The Longtan hydropower station has a high head, large reservoir capacity and an enormous potential to bear peak loads. The current design yearly utilization time is 4,580 hours. Because hydropower is used for peak regulation, there is an objective need for a rather low utilization time in electric power systems in which thermal power predominates. Some developed nations now are transforming some of their hydropower stations to expand the installed generators and lower the equipment utilization time. Areas without hydropower stations are even building reservoirs at enormous cost to store energy for peak regulation in an effort to obtain even greater comprehensive technical economic benefits in electric power stations. Arrangements are being made for both hydropower and thermal power. How is it that the view that "hydropower generates electricity an average of 2,000 hours less than thermal power" is an intrinsic attribute? Generators that do not generate electricity for a certain period or those undergoing repairs, those kept ready for use when accidents occur, and those used for phase regulation and frequency regulation are not called redundant capacity. Only hydropower stations with rather poor regulation capabilities and that part of capacity for using the large amounts of additional electric power during the rainy season are called redundant capacity. Moreover, the amount of redundant capacity is determined by whether or not it is used economically as a substitute for coal consumption in thermal power stations within electric power systems.

3. Besides the economy of each when comparing hydropower and thermal power, consideration also should be given to comprehensive benefits, social benefits and environmental benefits. Hydropower development, especially the development of hydropower in rather large river basins, generally involves development for multiple goals. This means that besides power generation, there are additional comprehensive benefits from flood prevention, irrigation, shipping, urban water supplies, aquaculture, tourism and so on. If investments for these goals are attributed to the corresponding departments and do not "eat from the big common pot" of hydropower, the cost per unit kW obviously would be lower and there also would be an obvious increase in economic results.

It also should be pointed out that if large-scale thermal power plants are built in load centers, it will be hard for the residents to accept the processing of coal slag, atmospheric pollution and thermal pollution of water sources. The additional investments needed to attain the necessary environmental protection also are considerable. It is not just that these problems do not exist in hydropower stations. They even have led to the growth of tourism in their areas in foreign countries and have created considerable financial resources.

4. The "Reevaluation" is correct in pointing out the problems in "sending western power to the east," but consistent adoption of a figure of 1,000

kilometers as the distance power is to be transmitted is unrealistic. The current understanding of "sending western power to the east" refers to the eastward direction of the tide of electric power and does not imply that a power station will be built on the Yarlung Zangbo Jiang to transmit power to Shanghai. The enormous hydropower station at Longtan supplies electricity to Guangzhou and the Ertan hydropower station supplies electricity to Chengyu, so the maximum distance of power transmission is only at the 670 kilometer level. Smaller hydropower stations will transmit power over even smaller distances. Only at Sanxia [Three Gorges] on the Chang Jiang will power be sent eastward over a distance of 1,000 kilometers to Shanghai, northward to Beijing and Tianjin and southward to connect with Guangzhou. The other hydropower stations are not up to this standard. A national power grid will be formed through the Three Gorges, however, and the benefits derived from it will grow as the power grid develops.

As mentioned above, these are objective facts. Absolutely no further consideration is needed. The conclusion that hydropower is not as economical as thermal power obviously is a superficial one.

III. The Method of Penetrating Phenomena To Grasp Their Essence

In comparing hydropower stations with thermal power stations, the primary investments are rather large and the construction period is rather long. This generally is an intrinsic attribute. Hydropower involves the development of primary energy resources and has rather low costs for electric energy. This also is a general intrinsic attribute. The question of the "time value of capital" exists both for investments and for costs, so what would be the overall economic results? They cannot be lumped together and require concrete analysis of concrete situations. Although the "Reevaluation" adopted the method of dynamic analysis and considered construction periods, it failed to grasp the essence and thus comes to an untenable conclusion.

1. As mentioned previously, the "Reevaluation" discusses the development of primary energy resources and energy resource conversion as one topic. The construction periods of coal mines and transportation facilities for thermal power plants are not considered. This sort of simple comparison is only a superficial numerical operation and does not grasp the essence of the thing.

2. The "Reevaluation" states that "average construction periods at present for hydropower construction are 5 to 6 years for medium-scale power stations, 8 to 9 years for large-scale power stations and 10 to 14 years or even longer for especially large-scale power stations, so the total construction period generally exceeds 10 years" and that "the construction period for hydropower is an average of 4 years longer than for thermal power." These figures may reflect certain statistics from practice but the question lies in whether or not they reflect the objective need for hydropower construction itself. Are there phenomena that temporarily await improvement? Construction periods themselves are elastic. The first hydropower station built in China after the nation was founded was the Shizitan hydropower station. The author remembers remarks made by Comrade Liu Lanbo [0491 3482 3134] at the time to

the general effect that Comrade Li Rui [2621 6904] was only at the work site for a few days and that the rate of progress in the pile of stone for the dam body was raised manyfold.

From the perspective of the time value of capital, the work period we are focusing on is the period from initiation of the main project to the generation of power, which also is the period between the investment of large amounts of capital to output and the ability to repay the principal and interest. The construction time involved at the Xin'an Jiang, Zhexi and other large-scale hydropower stations during the 1950's and 1960's was only about 3 years. Work was begun on the Sanmen Gorge project in 1957 and the generator turbines began turning in 1961. The author was on-site throughout and progress in the project as a whole indicates that the objectively necessary construction time was over 4 years. Construction of the Xijin hydropower station on the Yu Jiang began at the end of 1958 and water began spilling through the dam body in April 1961. It could have stored water and generated power at that time but political and economic reasons caused the Soviet Union to postpone the delivery of the generators and resulted in delays in power generation. All of this occurred during our early period of hydropower construction. We lacked experience and actual progress in the project during a period of economic difficulties. Brazil's Itaipu hydropower station, the largest in the world at present (with an installed capacity of 12.6 million kW), required only 7 years to build. Within China, construction of the Lubuge hydropower station now is under way and the construction period is controlled by the water intake tunnel. The Japanese submitted the middle bid at more than 80 million yuan and still will be profitable. A look at the following table shows the great difference.

Table

	Contract levels within China	Low bid in international bidding	Actual achievement of Japan's Taisei Company
Tunnel investment (million yuan)	200	140	80
Dimension of work area (meters)	50	200	200-300

If these examples are accepted as fact, it can be said that the work period used in the "Reevaluation" only reflects temporary problems in the organization and management of construction in certain projects in China at present and is not an inherently required construction period for hydropower construction itself.

3. A slightly longer construction period means that the time over which the interest on investments must be borne is slightly longer and that the interest will be slightly larger. In practice these are related as well as dissimilar numerical concepts, but the "Reevaluation" treats them in a simplified way as an identical numerical concept.

When divided according to the targets of labor, the overall construction process can be divided into three stages: 1) The earth and rock project stage, which has a low unit cost and requires few investments; 2) the concrete structure project stage, which involves a larger proportion of expenses for materials and requires more investments; and 3) the equipment installation project stage, which involves expensive equipment and concentrated investments. The construction period for hydropower stations is rather long and flow diversion engineering during the early period is special. It accounts for a rather long construction period but mainly involves earth and rock engineering. At the Xijin hydropower station, for example, the various proportions of total project investments were: 9.7 percent for temporary engineering, including the flow diversion project which took more than 1 year to build, 27.4 percent for permanent structural engineering, and 62.9 percent for equipment installation. These proportions are roughly similar for all projects. I now will use the Itaipu hydropower station built with international loans as an example. Its construction organization during the early period almost totally involved a large amount of earth and soil engineering. When the concrete engineering began, the construction organized the pouring of high strength concrete on many work faces and strove to reduce the construction period. They lost no time in beginning to install the generators to permit power generation as early as possible. A large amount of capital was invested in a concentrated way in an effort to achieve power generation and see results as soon as possible, and they strove to reduce the amount of interest. They had an intense financial viewpoint and capital inputs before generation were the focus of the geometric figure during the 7-year construction period. About 2 years remain before power is generated. The "Reevaluation" states that "hydropower must pay an additional 4 years' interest compared with thermal power...." Extrapolating from this, the construction time required for a 10 million kW thermal power plant would be zero or even a negative number. Isn't that a fairy tale? In fact, the construction period for installation of thermal power equipment generally takes longer than for hydropower. The reason is that before the machinery in the power plant is able to generate electricity, the thermal power must deal with the conversion of coal into steam, so installation of the corresponding equipment controls the construction period. The enormous boilers basically are assembled from scattered parts, which means that the capital needed for the expensive equipment must be used earlier than for hydropower. The author has been involved in thermal power plant construction as well as hydropower plant construction from beginning to end, so it is harder to determine which involves a greater interest burden. Model analysis that does not in any way conform to reality arbitrarily states that hydropower must "pay out interest for a construction period 4 years longer than thermal power." This is completely untenable.

It also must be pointed out that the figure of 792 yuan per kW in interest payments over the additional 4 years required for construction of hydropower calculates the one-time payment of an investment at 1,600 yuan per kW and calculates the result according to compound interest. Whether or not 1,600 yuan is the unit cost of hydropower on a national basis is unimportant. Only a "local landlord" would make the payment in one instance and bury it underground while waiting 4 years before using it in substantial amounts. Not only

does the author of the "Reevaluation" fail to seek truth from fact, he also fails to conform to financial concepts, with the result being the drawing of hasty conclusions.

IV. Conclusion

Premier Zhao pointed out in October 1980 while listening to a report by the former State Energy Commission that "in the long-term view, the energy resource problem requires us to become more involved in hydropower. The advantages here are considerable and it is a good thing to do for our descendants...China has such excellent hydropower resources that we must overcome some difficulties each year and squeeze out a few more investments for hydropower, even to the point of affecting other things, and principles and directions should be included in annual plans. There can be noticeable changes in 10 years and a major change in 20 years. This requires a strategic viewpoint. We cannot yield to the problems before us year after year and waste time. We will have made a great mistake when we look back in the future." Premier Zhao's description of the principles of energy resource construction in China are an incisive summarization of experiences and lessons in the 30-plus years since the nation was founded. The statement by CPC Secretary Hu Yaobang that "China is first under heaven in hydropower and the electric power industry leads the four modernizations" provides us with very great spiritual encouragement and strength. The publication of the "Reevaluation" article does not affect its correctness. Hydropower construction in China will enter a new high tide in the not so distant future and attain unprecedented and flourishing development.

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PREPARATORY WORK ON MANWAN STATION ACCELERATED

Kunming YUNNAN RIBAO in Chinese 8 Jan 86 p 1

[Text] Preparatory work on the Manwan hydroelectric station has been accelerated since it began in September 1985. More than 6000 construction personnel and 100-odd pieces of heavy equipment are already at the site hard at work during the winter construction season.

Units responsible for new road construction, including the 1st Office of the 14th Hydropower Bureau, the Jinsha Jiang Forestry Engineering Company, the Dukou Mechanized Construction Office, and others, are already at work on the road-building projects. They have excavated more than 900,000 cubic meters of earth and rock and opened up more than 24 kilometers of secondary roads; more than 10 kilometers of [main] roadbed have taken shape. The Provincial Power Engineering Company, the unit responsible for the power transmission and transformation projects, has begun work all along the 60 kilometers of 110-kilovolt transmission line and is now making preparations for work on a 60-kilometer-long 220kV transmission line. They have excavated 28,000 cubic meters for the 110kVA transformer station foundations and have already started work on the foundations and the building for the facility. The 1st Office of the Provincial Railway Construction Company and the 434th Factory of the People's Liberation Army, the units responsible for the construction of the foundation work on the suspension bridge, have already completed the excavation work. The 4.1-kilometer power station road has been started.

The work to install water, power, and lights and to level the site is being stepped up and it is estimated that this work could be finished by April 1986 which will prepare the way for construction to begin on the flood discharge channels and diversion tunnels of main part of the project.

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CSO: 4013/86

SECOND STAGE OF GEZHOUBA CONSTRUCTION DESCRIBED

Beijing ZHONGGUO SHUILI [CHINESE WATER CONSERVANCY] in Chinese No 12, 15 Dec 85 pp 16-17

[Article : "The Second Stage of the Gezhouba Project is Progressing Rapidly and the Da Jiang Power Station May Generate Electricity in 1986"]

[Text] Since the Er Jiang and San Jiang projects at the Gezhouba Key Water Conservancy Project began to provide results in July 1981, operating conditions basically have been normal. By the end of September 1985, the Er Jiang power station had generated 21.8 billion Kwh of electricity and became the main power plant in the Central China region. Its annual power output now has leapt to first place among China's hydropower stations. The amount of freight passing through the two enormous San Jiang locks has reached 19.17 million tons per year and the amount of freight passing through the locks has greatly surpassed the best level before the dam was constructed. The benefits of the project are quite remarkable. Recently, the Er Jiang and San Jiang projects and the water turbine generator earned special class national awards for scientific and technical progress.

The second stage of the Gezhouba project is progressing rapidly. The three large structures of the Da Jiang project, the power plant, the boat locks and the silt flushing locks basically have been completed.

The Da Jiang powerhouse is almost twice as large in scale as the Er Jiang powerhouse. The plan is to install fourteen 125,000 kW water turbine generators with a total installed capacity of 1.75 million kW. The roof already has been placed on the tall power station building and the people are cleaning up the worksite in preparation fo installation of the first generator that was manufactured by the Harbin Generator Plant. After the Da Jiang Power Plant is completed, the amount of power generated at Gezhouba each year will rise to 14.1 billion kWh. At that time, some of the electricity will be transmitted on 500 kV high tension DC lines over a long distance to Shanghai, China's industrial center.

Lying right next to the power plant are the Da Jiang boat locks, which are on a world scale. The lock chambers are 34 meters wide and have an effective length of 280 meters, the size of 26 basketball courts. It can pass 5 to 6 Hanyu [Hankou-Chongqing] passenger steamers at one time and also can handle 10,000-ton class barge trains. The downstream gates of the Da Jiang locks are one-half meter higher than the gates downstream from the No 2 San Jiang lock and about as tall as the 13-story apartment buildings next to the front gates in Beijing. A single fan gate weighs 600 tons and is aptly named "the first gate under heaven." The two large gates already have been put in place.

To the right of the boat lock lies the Da Jiang silt flushing lock. It has nine holes with steel arched gates 12 meters wide and 19 meters tall. They are the largest arched gates in China at present. The arched gates now have been installed and the gate hoists are in place. Overall opening adjustments can be carried out shortly. The Da Jiang Project is located on the protruding bank of the curving river and has extremely serious silt accumulation. Moreover, the capacity of the Gezhouba reservoir is only 1.58 billion cubic meters, which is quite small in relative terms. The amount of silt arriving each year, however, is more than 500 million tons, which is a substantial amount. Those who have seen Gezhouba cannot help but feel worried when they note the serious silt accumulation outside the weirs upstream and downstream from Da Jiang, which is quite natural. The incoming ship channels upstream and downstream from San Jiang extend for a total of 6,400 meters. They have been in operation for more than 4 years and carry out 2 or 3 silt flushings after the rainy season each year. Each flushing lasts for a day and most of the accumulated silt is flushed away, with very good results. Comrades in navigation departments have evaluated it, saying that the design composition "pass ships in calm water, use flowing water to flush the silt and supplement it with mechanical dredging" has been successful. How can the silt accumulation problem on the Da Jiang be solved, then?

Besides installing more low sand discharge holes in the power plant, design personnel have used hydraulic engineering experiments for a unique installation of nine silt discharge floodwater drainage gates. The water flowing in the Chang Jiang during the rainy season carries a great deal of silt. Opening the gates to drain off the floodwaters and discharge the silt not only can reduce silt accumulation in the reservoir but even more importantly can reduce the amount of silt passing through the water turbines.

The Gezhouba project already has experience in project construction during the first stage and construction at the Da Jiang project obviously has speeded up. Beginning with the drainage of the base pit at the Da Jiang project at the end of 1981, part of the earthworks at the Da Jiang project basically were completed in less than 4 years. More than 10 million cubic meters of earth and stone have been excavated and almost 5 million cubic meters of concrete has been poured. This means that 110 percent and 95 percent of the total design amounts, respectively, have been completed.

Construction of the Da Jiang project now has entered a key period. Under encouragement by the fighting order of "guaranteeing power generation by four generators in 1986" issued by the CPC Committee of the project bureau, the 50,000 employees are working with one heart and going all out. Only a half year's time remains between now and the connection of the first generator to the grid and power generation in 1986. The two large mountains at the upstream and downstream cofferdams must be moved, including the clearing of sediments outside the cofferdams, a total of 10 million cubic meters. In addition, the water turbine generators and more than 10,000 tons of locks, openers and closers and other metallic structures must be installed, which is a rather enormous task. The people at Gezhouba have said with full confidence, however, that they will achieve water cutoff by the end of 1985, which can be compared best to being given the right to go out of bounds during a ball game. There is work that must be completed to guarantee that four generators can generate power in 1986. Destruction of the top and removal of the upstream cofferdam began on 1 October 1985 an all items of work are proceeding apace and in an orderly fashion.

12539/12223
CSO: 4013/85

FUJIAN HYDROPOWER PROJECT RACING TO MEET TARGET DATE

Fuzhou FUJIAN RIBAO in Chinese 10 Jan 86 p 1

[Article by Zhang Lisheng [1728 4409 1840]: "Hydropower Station Aims To Generate Electricity by 1987"]

[Excerpt] Construction is proceeding at a frantic pace at the construction site of the Shaxikou hydropower station, one of the nation's priority construction projects. It will have an installed capacity of 300,000 kW. The staff and workers of the Minjiang Engineering Bureau have set next year as the target date for power generation and are going all out to ensure a resoundingly successful beginning for the Seventh Five-Year Plan.

The general plan envisions the "waging of three major battles" before the power station can begin producing electricity in 1987: foundation excavation for the project proper, pouring of concrete on the main dam and the station, and debugging of installations and equipment. It is reported that the excavation battle has been won decisively and that the major focus of the project since last July has been shifted to the concrete-pouring battle. At present, with the exception of the spillway, concrete has been poured up to the flood-control level on most of the dam. Similar work has begun on the station.

On New Year's Eve, the Minjiang Engineering Bureau called together responsible individuals at all levels to work out a plan for the dry season. Their top priority in the next 3 months (that is, before the floods come) will be to do everything possible to complete their work at the dam and the main and secondary buildings to the flood-water level, ensure their safety during the flood season and create favorable conditions for the construction of the project through that period. That is essential if they are to smoothly proceed on to the third battle--the debugging of installations and equipment.

This dry season is extremely critical to the workers and staff of the Minjiang Engineering Bureau, which explains why the moment we entered the site, we immediately became aware of a fast rhythm sharply at variance with that outside. Shortly after 5 pm on 30 December, we left Fuzhou for the construction

site and were met by Deputy Director Zhang Yunlong [1728 0061 7893] of the bureau and leaders from its planning office and the phase two office as soon as we left Nanping Railway Station. That very morning they had just attended a power plant construction coordination meeting convened by the provincial government. The meeting decided to close to traffic before 15 February on a section of an old highway leading to the reservoir in order to provide even more favorable external conditions for the construction of the project. To rush through the transportation of some materials before the closure takes effect, Zhang Yunlong and others at once hurried back to the construction site and transmitted the essence of the meeting. In addition, the Minjiang Engineering Bureau invited leading comrades from the Fuzhou branch of the Railway Bureau and others in charge of public works, electric power, road works and transportation agencies to the site in the afternoon 2 days before New Year's Day to consider the excavation and concrete-depositing plan for the northern part of the dam near the railway track. A responsible comrade from the branch bureau told reporters, "The Railway Bureau will certainly coordinate its moves closely within the Minjiang Engineering Bureau and take appropriate measures to ensure the smooth progress of the project at the dam as well as railway safety."

12581/8309
CSO: 4013/88

SMALL-SCALE HYDROPOWER BRINGS MAJOR CHANGES TO COUNTRYSIDE

Beijing NONGCUN KEXUE [RURAL SCIENCE] in Chinese No 12, Dec 85 p 23

[Article by Zhu Bin [2612 2430]: "A Discussion of Rural Energy Resources--Small Hydropower and Its Development"]

[Text] In the late 1970's and early 1980's, just when many nations in the world were searching for a solution to rural energy resource shortages, small hydropower developed notably in China's countryside. Some energy specialists in foreign countries have called China's small hydropower and methane the two new stars of rural energy resources in China.

In 1949, China had only 26 small hydropower stations with an installed capacity of 2,800 kW. By the end of 1980, China had built more than 88,000 small hydropower stations with an installed capacity of 6.93 million kW and yearly power output of 12.7 billion kWh, equal to one-third of all electricity used in agriculture in China. To make it possible to send electricity produced by small hydropower stations to everyone, many counties, townships and villages have built high voltage lines (35 kV and less) and low voltage lines (4 kV) to form many small power grids across the rural areas of China.

The reason that small hydropower developed so quickly in China was that it is adapted to the characteristic of decentralized electricity use in the rural areas of China (especially in mountainous and semi-mountainous areas). It is hard to depend on large power grids to transmit power at present, while locally operated small hydropower does not require the construction of power transmission lines to send power over long distances. It also can be integrated with farmland water conservancy construction to achieve comprehensive utilization of rivers. Moreover, when we compare construction of small hydropower with power stations of a moderate size or larger, the former not only involves shorter construction schedules but also requires fewer one-time investments and total investments. Townships and villages as well as individual peasants can build and manage them, and if the state provides certain capital assistance, the costs of generating power in small hydropower stations is rather low. The cost per kWh in many areas is only a few fen, something peasants warmly welcome.

A mountainous county that builds a 10,000-kW small hydropower station not only can provide motive power for township and town enterprises and for electrical irrigation and drainage, but it also can solve problems in household electricity use like lighting and thereby raise material and cultural standards in rural areas. An example is Dingjiaping Village in Taoyuan County, Hunan Province, which raised 95,000 yuan of its own capital in 1982 to build a small 75-kW hydropower station. It led to major changes in the appearance of this mountain village. Not only did all the peasant households in the village use electricity, but they also installed electric pumps, rice mills, threshers and oil presses. The power station operated for 3,100 hours in 1983 and the income from electricity fees was more than 6,800 yuan. Because electricity was used for cooking, about 180 cubic meters of timber could be conserved each year, which has brought about a change for the better in forest destruction.

The Chinese continent has many rivers, more than 5,000 of them with basins larger than 100 square kilometers in area, and there are even greater numbers of medium and small rivers. The steep slopes in mountainous regions, rapid-flowing streams and large drops all generally have the capacity for generating electricity. This is especially true of small-scale power generation. International stipulations now state that small hydropower stations with a single 6,000 kW generator and total installed capacity of 12,000 kW and below are called small hydropower. China has total small hydropower reserves of about 150 million kW, about 70 million kW of which can be developed. In terms of the regional distribution of these energy resources, they are concentrated mainly in 13 provinces and autonomous regions including Hunan, Hubei, Henan, Fujian, Zhejiang, Jiangxi, Yunnan, Guizhou, Sichuan, Xinjiang and Xizang.

Hydropower stations are factories that convert water energy into electricity. The conversion of water energy into electricity requires the building of some structures to centralize the dispersed head. In addition, some electromechanical equipment like water turbines and generators also must be installed. The water power must drive the turbines and the turbines must turn the generators before electricity can be generated. Electric equipment and power transmission lines send the electricity to users. Development of small hydropower, therefore, first of all requires a good energy resource survey. Attention must be paid to a full complement for small hydropower, and there should be a focus on water resources and unified arrangements for power transmission, transformation and seasonal loads. Cascade development runoff power stations should be concerned with increasing and opening up water resources and building reservoirs when drawing up plans to guarantee the ability to supply electricity during dry periods.

The development of small hydropower in rural areas also should consider its affects on the ecological environment. In some areas, the construction of reservoirs has caused changes in the underground water level, and it is possible that the soil may become sandy or saline-alkaline. Some areas have experienced serious water losses from reservoirs due to limestone structures or fractures in reservoir regions. Furthermore, the construction of small hydropower stations has affected river navigation and destroyed normal growth of aquatic organisms, and so on. All of these questions require serious consideration.

Small hydropower in China now has reached a significant scale. We hope that [installed capacity] will reach 9.83 million kW in 1985, 13.83 million kW in 1990, 18.83 million kW in 1995, and plan to add an additional 6.5 million kW during the years 1996-2000. At present, however, half of the townships and towns in China have no electricity and the level of electricity use in rural areas remains very low. Over the next few years or decade and more, it is unrealistic to expect to rely on state power grids to satisfy the electricity needs of rural areas. For this reason, scientific utilization of China's abundant and widespread small hydropower resources in rural areas, reliance on local financial resources, and adoption of the principle of integrating water control and power management in a major effort to develop small hydropower make this new energy resource star in China sparkle even more brightly and remains a glorious but enormous task that hangs before us.

12539/12223
CSO: 4013/85

FIGURES FOR SMALL-SCALE HYDROPOWER CONSTRUCTION, PRODUCTION RELEASED

Beijing ZHONGGUO SHUILI [WATER CONSERVANCY IN CHINA] in Chinese No 11, 15 Nov 85 p 31

[Text] Status of Small-scale Hydropower Construction, Production From January-September 1985

Region	Number added (stations)	Newly installed capacity (kW)	Electricity generated (100 million kWh)
National total	663	257,124.4	180.801
Beijing City	-	-	0.270
Hebei Province	3	3,500	0.610
Shanxi Province	-	-	0.875
Nei Monggol	-	-	0.398
Liaoning Province	1	1,300	0.971
Jilin Province	-	-	2,450
Heilongjiang Province	3	6,500	0.680
Jiangsu Province	1	500	0.300
Zhejiang Province	30	9,025	10.263
Anhui Province	14	4,392	1.021
Fujian Province	96	29,400	20.500
Jiangxi Province	57	11,915.5	9.038
Shandong Province	-	-	0.500
Henan Province	2	369	3.000
Hubei Province	15	20,920	9.365
Hunan Province	29	21,473	25.057
Guangdong Province	103	70,000	29.000
Guangxi	28	16,730	12.834
Sichuan Province	89	42,000	29.000
Guizhou Province	8	2,240	4.600
Yunnan Province	11	9,086	9.635
Xizang	-	-	-
Shaanxi Province	163	2,205.9	1.497
Gansu Province	2	2,199	2.100
Qinghai Province	1	130	1.300
Ningxia	3	360	0.007
Xinjiang	4	2,879	5.500

(Compiled by the Small-scale Hydropower Office, Rural Electrification Department, Ministry of Water Resources and Electric Power)

/8918
CSO: 4013/86

BRIEFS

RURAL HYDROELECTRIC CONSTRUCTION--Beijing, 4 Mar (XINHUA)--Last year, 1,037 small hydroelectric power stations, totaling 460,000 kilowatts, were built in China's rural areas. This brought the total number of such small rural power stations to some 74,000 and their total power-generating capacity to 9.52 million kilowatts. Last year, supply of electricity was available in 90 percent of the townships and 70 percent of the villages in China, and 63 percent of the peasant households can use electricity. [Summary] [Beijing XINHUA Domestic Service in Chinese 0021 GMT 4 Mar 86 OW] /7358

HUNAN RURAL ELECTRIFICATION--Last year, Hunan Province made further progress in the electrification of rural areas. Ten countries, including Pingjiang, Cili, Hengdong, Longshan, Xupu, Xinhuang, Suining, Lanshan, Chenxian, and Lingxian, which were included in the 100 counties throughout the country which were carrying out a pilot project of electrification of rural areas, built 23 small hydroelectric power stations which were put into operation last year. Their electricity output reached 540 million kilowatt-hours. As a result, some 670,000 households in the 10 counties used electricity supplied by the small hydroelectric power stations. They accounted for 72.5 percent of the total number of the peasant households. Some 32,000 households used electrical cooking utensils. The number of households using electrical cooking utensils was some 8,000 more than in the preceding year. [Summary] [Changsha Hunan Provincial Service in Mandarin 2300 GMT 16 Feb 86 HK] /12232

GUANGXI SMALL-SCALE OPERATIONS--Nanning, 26 February (ZHONGGUO XINWEN SHE)--This reporter has learned from the Guangxi Regional Department of Water Resources and Electric Power that, up to the present, almost 9,000 hydroelectric power stations have been built on more than 1,000 medium-sized and small rivers in Guangxi with a total installed capacity of more than 790,000 kilowatts, generating more than 34 percent of the total volume of power generated in the whole autonomous region. At present, each county in Guangxi has one or several key hydroelectric power plants. In some relatively developed counties, the yearly power consumption is about 170 kilowatt-hours per capita. With economic development under way, the peasants in some remote mountain areas have raised funds on their own to build small hydroelectric power stations with a capacity ranging from 1,000 to 5,000 kilowatts, thereby ending the situation in which kerosene lamps are used for lighting and rice is husked by means of stone rollers. [Text] [Beijing ZHONGGUO XINWEN SHE in Chinese 0138 GMT 26 Feb 86 HK] /12232

SICHUAN SMALL-SCALE STATIONS--Chengdu, 25 February (XINHUA)--Sichuan Province is building more small and medium-sized power stations to meet the needs of booming rural industry. By the end of 1985, Sichuan had built 14,000 small and middle-sized power stations. Their production capacity is 7.3 billion kWh, equivalent to about one-fifth of the energy put out by the large power stations in the province. Their installed capacities range from 10 to 25,000 kW. [Text] [Beijing XINHUA in English 1135 GMT 25 Feb 86 OW] /12232

HONGSHI'S FIRST GENERATOR OPERATIONAL--The first 50,000 kW water turbine generator at the Hongshi hydropower station was formally connected with the grid on 25 December 1985 and began generating power. A meeting to commemorate this event was held at the power station on 26 December. Located between the Fengman and Baishan hydropower stations, it is the third cascade station to be built on the Di'er Songhua Jiang. The dam across the river is a concrete gravity dam 438 meters long and 46 meters high, and it has a reservoir capacity of 149 million cubic meters. The amount of concrete engineering required was 470,000 cubic meters. The total installed generator capacity of the four generators in the power station below the dam is 200,000 kW and annual power output is 440 million kWh. Groundbreaking for construction began in September 1982, and flow diversion was achieved in September 1983. The gates were lowered to collect water in November 1985 and the entire tailwater project was completed in December. Conformance to quality specifications was 100 percent. The first startup of the No 1 generator was successful and the committee that examined the startup of the Hongshi hydropower station generators felt that the quality of design, manufacture, construction, and installation was excellent. [Excerpts] [Changchun JILIN RIBAO in Chinese 27 Dec 85 p 1]

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CSO: 4013/79

BRIEFS

GUANGDONG EXPANSION PLANS--To speed up the construction of the province's power industry, the provincial People's Government will concentrate financial and human resources to build several key thermal power plants within 3 years, so as to make improvements in the province's power industry by 1988, and basically overcome the power supply shortage by 1990. Our reporter learned this today from the 18th meeting of the 6th Provincial People's Congress Standing Committee. At the third meeting of the Sixth Provincial People's Congress Standing Committee held in May last year, a proposal was raised to speed up the province's power industry to meet the needs of the province's economic development. At the meeting, a proposal was submitted to the provincial People's Government for implementation. The provincial government has since attached great importance to implementing the proposal, and has adopted many positive measures to solve some problems in the production and building of the power industry. [Text] [Guangzhou Guangdong Provincial Service in Mandarin 1000 GMT 22 Feb 86 HK] /12232

300 MW UNIT USES FOREIGN TECHNOLOGY--China's first 300 MW thermal power generating set in which all the main machinery such as the boiler, gas turbine, generator, and high-pressure heater have been made with the use of imported technology, was recently completed at the factory of the Shanghai Electrical Joint Company. The project was a major item under the Sixth Five-Year Plan. Tests showed that manufacturing quality met the design specifications of the American side. The generator set's manufacturing technology was transferred from the Westinghouse Corporation and the Fuel Engineering Corporation of the United States. Compared to domestically manufactured generating sets of the same kind, it is 2 percent more fuel-efficient and can save 12,000 tons of standard coal a year. [Text] [Shanghai JIEFANG RIBAO in Chinese 30 Dec 86 p 1] /8918

ZHEJIANG'S FIRST 200 MW UNIT--At 10 am on 1 December 1985, a key state project -- the Zhenhai Power Plant No 3 generator -- underwent 72 hours of continuous full load operation and was formally connected with the grid for power generation 161 days ahead of schedule. This is the first 200 MW large-scale generator in Zhejiang. According to state plans, formal connection of the No 3 generator to the grid and power output was scheduled for May 1986. To alleviate the power shortage, the Ministry of Water Resources and Electric Power called for it to be completed and turned over for operation ahead of schedule (by the end of 1985), making it part of the 5 million kW the State Council wanted installed in 1985. [Excerpts] [Hangzhou ZHEJIANG RIBAO in Chinese 22 Dec 85 p 1]

YAOMENG UPDATE--Zhengzhou, 23 Dec--The second-stage expansion project of the Yaomeng power plant in Henan Province is progressing smoothly and the No 3 generator set (installed capacity: 300,000 kilowatts) officially went on stream yesterday. The second-stage expansion project of the Yaomeng power plant was a major construction item under the Sixth Five-Year Plan. The state made a decision to build it in 1983 to help resolve the power shortage in central China. This generator brings the plant's total installed capacity up to 900,000 kilowatts and increases the yearly power output from 3.5 billion kilowatt-hours to 5.3 billion kilowatt-hours. The Yaomeng power plant is located in the Pingdingshan coal field and is a major thermal power facility in China. [Excerpts] [Beijing RENMIN RIBAO (OVERSEAS EDITION) in Chinese 25 Dec 85 p 3] /8918

210 MW GENERATOR TO PAKISTAN--According to the Ministry of Machine Building Industry, China's largest generator export project from an international bid--a 210 MW thermal power generator--began to transmit electricity at Pakistan's Gudu power plant on 9 January. Gudu power plant's U.S.$56 million 210 MW generator project was contracted by the China National Machinery and Equipment Import and Export Corporation in bidding involving a few international companies. The main generating engine of this set which uses internationally advanced technology was manufactured by the Harbin Electrical Machinery Plant, the Harbin Turbogenerator Plant and the Harbin Boiler Plant. The Hubei Electric Power Construction Company assembled the entire project in less than 15 months. [Text] [Beijing RENMIN RIBAO (OVERSEAS EDITION) in Chinese 18 Jan 86 p 1] /8918

HUANGPU COAL CONVERSION -- The project to convert the Huangpu power plant from oil to coal has begun. This project, a major one for Guangdong during the Seventh Five-Year Plan, was begun on 28 February 1986. It is one of the big thermal power plants in the Guangdong grid. The major equipment for the project comes from Shanghai and total investment will be 687.4 million yuan. When completed, it will be able to generate 443 million kWh more than it previously could and save more than 100 million yuan in fuel costs a year. [Text] [Beijing RENMIN RIBAO (OVERSEAS EDITION) in Chinese 3 Mar 86 p 1]

QIN LING UPDATE -- The Qin Ling power plant (design capacity: 1.05 million kilowatts), a major construction project being undertaken by Shaanxi Province and the Ministry of Water Resources and Electric Power, has completed the installation of 850,000 kilowatts. Today, this power plant is generating 4.8 billion kilowatt-hours of electricity a year, more than 40 percent of the province's total output, and is the largest thermal power plant in the northwest. [Text] [Beijing RENMIN RIBAO (OVERSEAS EDITION) in Chinese 4 Mar 86 p 1]

CSO: 4013/96

COAL INDUSTRY TARGETS, TASKS FOR 1986 DETAILED

Production Targets for 1986

Beijing ZHONGGUO MEITAN BAO in Chinese 11 Dec 85 p 1

[Text] The leading party group of the Ministry of Coal Industry has decided that the overall target in 1986 of the coal mining system will be the implementation of the comprehensive contract system, the completion of the first-year tasks of the 7th FYP, and such efforts will be centered on the improvement of the economic benefits and guided by the spirit of the National Party Congress. Comrade Ye Qing [5509 7230] made the above announcements in the National Coal Work Conference.

Ye stressed that 1986 is the first year of the 7th FYP and the second year for the implementation of the comprehensive contract system by the unified distribution coal mines in China. Whether some solid progress can be made next year is very important to reaching the goals of the 7th FYP. Leaders at various levels should take the task seriously and mobilize all the coal workers to accomplish the objectives.

The major targets for 1986 are: raw coal production of 870 million tons, including 423 million tons from unified distribution mines and 447 million tons from local coal mines, and capital construction of 5.37 billion yuan. The economic and technological goals are raw coal production efficiency of 0.95 tons per worker, recovery rate of 78.1 percent, ash content of commercial coal of 21.2 percent and an average energy consumption for the industrial production value of 11.68 tons/10,000 yuan.

In order to achieve the major targets described above, the following 13 tasks must be completed in 1986:

1. Continue to work on the comprehensive contract system.

A concerted effort must be made to perfect and implement the contract project and the associated reforms. Put the contract system on a solid basis by simplifying the delegation of power, smoothing the coordination, raising the revenue and cutting the expenses, and consolidate the internal operation.

2. Devote a major effort to the basics of management.

Establish the necessary rules and regulations for standardization and quantification; work on the trial of fixed cost test points. Move away from the small production mode and strive for modern management. A leadership policy making system and management by objective should be established on the basis of economic efficiency improvement. The leadership personnel should be working under an objectives-term system and should be held responsible if the objectives were not reached within the term. Comprehensive quality control and labor force management should be implemented to accomplish economic accounting and supervision.

3. Mechanize the mining of coal and establish model coal mines.

The mechanization of the unified distribution mines should reach 47 percent, including 25 percent of mechanized general mining and 10 percent of high grade coal mining. The mechanization of mining equipment should reach 48 percent including 4 percent for combines. Continue to strengthen the current million-ton terms and produce more million-ton terms. Accelerate the improvement of current combine work surface, add some new high grade mining, and pay attention to speed and efficiency in the mechanization of construction to improve the benefits of mechanization. Raise the utilization rate of mining equipment, and establish service and repair centers.

Modernize the 15 model mines. In certifying the model mines, qualified mines should be officially named and receive a certificate from the ministry; unqualified mines should be held responsible for failing to pass. A second group of model mine test points and model mining bureaus should be selected.

4. Plan for capital construction.

The size of new mineshaft construction should be controlled properly in order to recover the benefits of the investment, basically no new mines should be built. For continuing construction projects, attention should be given to key tasks that determine the construction time. Temporarily halted constructions may be continued at some future time. For remodel and expansion projects, presently available equipment and facilities should be used whenever possible in order to fully utilize the potential resources. Technological improvement programs should be carefully planned.

5. Develop local coal mines with proper planning and management.

First solve the planning and layout problems for local coal mines and then work on the state operated mines. Improve the ability to respond to market changes by strengthening the management, changing the operation, and developing the transportation.

Consolidate all the village and township coal mines in the country, including coal mines funded by groups of people and individuals, so that a majority of the coal mines are improved and begin a healthy development. Improve the technology in local mines to strengthen their ability to fight incidence and to utilize the resources.

6. Stress operation safety.

The priorities in operation safety for next year are: strengthen safety in management and supervision, make better use of the safety equipment, control gas and coal dust to avoid fire, improve quality, and stress safety in village and township coal mines.

7. Diversify the operation and make the necessary conversions.

In addition to quality improvement, attention should be given to product variety, sales, and capital turnover; closely monitor market changes and trends. To diversify, the coal mines must first work on their coal dressing and develop a variety of coal products.

8. Accelerate technological improvements.

In technological improvement, the major tasks are: strengthen the activity of research units and the enterprise vitality of the coal industry, accelerate the production of urgently needed products, promote the products, and shorten the period in transforming technological innovation to production capability. In the winter of 1985 and the spring of 1986, the 7th FYP projects stipulated by the State Science and Technology Council must be put on a solid basis. In 1986, the priorities should be a faster technological development, promotion, and conversion to production capability. In the area of computer application, efforts should be made to exploit the benefits of existing computer systems and microcomputers and to train the personnel. Technical information and publication should continue to serve technological improvement and the users.

9. Broaden the contents of coal education.

In adjusting the ratio of general coal education and specialist training, attention must be given to both ends of the spectrum. On the adult education side, it should include higher education of the staff, middle school and vocational education of cadres, and continued engineering education to bring in new knowledge. On the general education side, efforts should be made to solve the teachers and fundings problems in the elementary education in the mining area.

10. Actively attract foreign investment, create foreign exchange, and speed up the absorption of imported technology.

11. Devote efforts to the geology, design, manufacture and supply areas to meet the present and long term needs in coal production. Stress quality in the production of mining machinery, work on technical service, and react to the market needs in China and abroad.

12. Straighten out the party morale and set up the learning of the Marxist-Leninist theory. The party committees and the units in charge of discipline should assume their responsibilities and accept the supervision of the public, primarily that of the staff representative council. Adhere to the party morale responsibility system in which each level is responsible to the higher level and in charge of the lower level, and quickly improve the party morale.

13. Step up the work on political ideology.

The party political workers must pay attention to ideology. The party committees of the enterprises should assume the leadership role in political ideology, strengthen the rank of political workers and carry out the education of policies.

Principal Tasks Outlined

Beijing ZHONGGUO MEITAN BAO in Chinese 11 Dec 85 p 1

[Text] In the National Coal Working Conference on 3 December, Comrade Ye Qing made a report entitled "Strive to accomplish the 7th FYP goals by innovation and improvement" and clearly outlined the p ncipal tasks for the coal industry in 1986.

The principal tasks are: While giving reform the top priority, continue to improve the unified distribution mines and implement the reform measures under the general contract system. Establish a vital Chinese-style coal enterprise and economy. Adhere to the "Two Cultures" policy and pay attention to spiritual cultural construction and strengthen the political ideological effort. Build up a devoted and capable coal workers team that is disciplined and educated. Rely on technological improvements, improve the economic efficiency, complete the tasks under the general contract practice, modernize the coal industry, and strive toward the goal of quadrupling the value of production.

The targets to be strived at are: (1) Produce 1 billion tons of raw coal, achieve an annual growth of 20 million tons in unified distribution mines and local mines, exceed an average yield of 1 ton [per worker] in unified distribution mines, achieve 56 percent mechanization of excavation and extraction in unified distribution mines, including 29 percent of excavation and 11 percent of extraction. (2) Invest 31.5 billion yuan in capital construction, 180 million tons of start up and 167 million tons or production. (3) Finance: 300 million yuan per annum contracted to unified distribution mines. (4) Machine building: 450,000 tons of products; approaching or achieving international standard in excavator, extractor, heavy scraping transport, and hydraulic frame. (5) Safety: reduce the average death rate per million ton in unified coal mines by 7.6 percent and basically prevent major incidents. (6) Accounting: complete an internal accounting network. (7) Geology: conduct priority survey, produce 20-25 billion tons of industrial reserve and increase verified reserve by 50 billion tons. (8) Design: complete design improvements of constructions underway and designs for new projects, finish the design preparation for 21 new priority mining zones. (9) Supply: Actively organize the available resources to guarantee production needs. The goals for the last phase of the 7th FYP include the production of 3.5-4.0 million tons of cement per year and reduce the mineshaft lumber consumption to 60 cubic meters per 10,000 tons of coal produced. (10) Sales: conduct market survey and prediction, match supply and demand, and reduce pile-up. (11) Research: complete priority tasks, step up the conversion from research results to production capability. (12) Education:

increase the student population to 120,000 and train 180,000 technical people in 5 years. (13) Import and Export: increase the export volume to 20 million tons, organize the export of machinery and electrical products, actively utilize foreign investments and introduced advanced technology. (14) Information and publication: establish a service center and an information network for the search and exchange of coal technology literature, double the variety and printing of technical literature. (15) Environmental protection: improve the environment, control the pollution, and bring the release of the "three wastes" to meet the state standard. (16) Living: improve the workers' income, increase the living area, and take care of the half million people waiting for jobs.

National Conference on Coal Supplies

Beijing ZHONGGUO MEITAN BAO in Chinese 11 Dec 85 p 1

[Article by Li Renfu [2621 0088 6534]: "National Conference on Coal Supplies a Success"]

[Text] With the encouragement of the leadership of the State Council and the support of the State Economic Commission, the State Planning Commission, the Ministry of Railways, the Ministry of Communication, and the State Supplies Bureau, a National Conference on Coal Supplies was successfully concluded on 5 December in Changzhou. Vice Premier Li Pong [2621 7720] attended the meeting in person and gave important instructions concerning major issues.

This was the first important meeting since the unified production-transportation-sales was put into practice, and the meeting showed that the unified scheme is a success. The success rate of the coal supply contracts has increased every year and reached 99 percent in the first 9 months in 1985. Based on the plans of the State Planning Commission, the output of the unified distribution mines in 1986 will be 19.32 million tons higher than the production orders of 1985. A new situation has emerged in the changing coal market.

Local buyer's market in coal supply is a good sign. It will help to improve the service and coal quality. An extensive study and analysis was also made for the unified scheme. Based on the successful reform, further improvements will be made and efforts are directed toward fixed point supply. Long term contracts will be established between the coal mines and the enterprises and the goal is 80 percent contraction. The time and effort spent on adjustment meetings and order meetings will be reduced.

The Ministry of Coal Industry calls upon the various mining bureaus to fulfill their contract obligation and to improve their coal quality, increase their product variety, and upgrade their services.

9698/12232
CSO: 4013/66

COAL MINISTER DISCUSSES REFORMS, FOREIGN COOPERATION

Hong Kong JINGJI DAOBAO [ECONOMIC REPORTER] in Chinese 18 Sep 85 pp 19-20

[Article by Zhang Chengzhi [1728 2110 1807]: "China Coal Industry's Reform and Cooperation: A Visit to Minister of Coal Industry Yu Hong'en"]

[Text] New Minister of Coal Industry Yu Hong'en recently granted me an interview in which he spoke about the reform of China's coal industry and about developing foreign cooperation.

Yu Hong'en, 57 years old, is from Ju County, Shandong. Before becoming Minister of Coal Industry on 19 June of this year [1985], he was the first deputy minister; in October 1982 he was elected a member of the CPC's Twelfth Central Committee. He has been praised for his decisive handling of affairs, his thorough familiarity with coal production, his investigative skill and his insistence that production problems should be studied and solved at first hand. He began studies at the Beijing Mining Institute in 1956 and subsequently became a shift foreman, a mine foreman, and the mine director at the Hegang Coal Mine in Heilongjiang, mining office chief, and deputy head of the Heilongjiang Province Coal Management Office. He has abundant practical experience and theoretical knowledge of coal production and its management.

Implementation of the General Investment and Production Contract

Yu Hong'en told me that China's coal industry is instituting the 6-year general investment and production contract, which constitutes a major reform of the coal industry's economic system. The general contract works as follows. Coal mines under central control undertake a 6-year general contract with the state from now to 1990, specifying output, the scale of capital construction and investments in it, and profit or loss. When the general contracts are instituted, all of China's centrally controlled coal mines will be required to carry out the state-specified plan of producing 500 million tons of raw coal by 1990. During this period the state will allocate a total investment of 31.5 billion yuan to the Ministry of Coal Industry; all other expenses will be borne by the ministry. Eight months

of the general contract have now been completed, and the general situation is good.

Yu Hong'en added that the production and construction situation in the first half of this year is reflected in the following statistics:

From January to June, total output of raw coal nationwide was 411.8 million tons, which is 23.42 million tons above quota and an increase of 11.12 percent over the same period last year. The centrally controlled coal mines produced 208.27 million tons of raw coal, 11.62 million tons above quota. The local coal mines produced 203.53 million tons, 11.80 million tons above quota, and in particular the small-town coal mines increased their output by 26.7 percent over the same period last year.

In the first half of the year the centrally controlled coal mines fulfilled 59.09 percent of the plan for tunneling footage.

In the first half-year 32.5 percent of the annual quota for capital construction was carried out, up 18.1 percent from the same period last year. In new mine construction, 50.3 percent of the plan for shaft and level footage was completed, up 4.6 percent from the same period last year.

In comparable cases, the financial losses of centrally controlled coal mines have decreased by 132 million yuan from the same period last year; total losses are now 211 million yuan. But if we exclude the loss of earnings resulting from an 83-day delay in issuing the coal price alleviation policy, the figures represent a profit.

Overall production efficiency [for all personnel] in centrally controlled coal mines, unit coal face output and unit advance in tunneling all have increased.

Yu Heng'en summarized some of the new characteristics of the coal industry that have resulted from the deepening of economic system reform and the spread of the general contract system.

First, the coal industry has a certain degree of autonomy. The major factor in its autonomy with regard to personnal, finances, materials, property, procurement and sales is that its financial rights have been expanded. The enterprises have control of a certain amount of money to spend as they see fit, enabling them gradually to undertake certain things that were not possible in the past and making them more able to maintain a capability for simple reproduction, self-modernization, self-renovation and self-development. Preliminary estimates indicate that the country's centrally controlled coal mines have made good use of government policies and have strengthened their management. They will be able to increase their earnings by several hundred million yuan a year, which will amount to over a billion yuan over the 6-year general contract period. After they have covered

certain increases in expenses, the general contract will still bring a certain amount of strength to the coal mines.

Second, the problem of eating from the "big rice pot" has been solved to some degree. Since the implementation of the general contract and of wage contracting by coal tonnage, various contracting and distribution methods have been adopted within the enterprises; responsibilities, rights and interests have been linked together, and the enterprises and their personnel have been motivated to produce.

Third, in the course of the reform many coal enterprises have accelerated their change of course and restructuring, have taken the initiative in regard to economic benefits, and have converted themselves from single-product producers into relatively independent self-managing socialist commodity producers that take responsibility for their own profits or losses. A rather large number of enterprises have developed diversified operations centered on coal; and comprehensive utilization and initiative in opening up outside markets have developed new routes to various types of external joint operations and cooperation.

Yu Hong'en said that many difficulties have been encountered since the general contract was instituted. The chief difficulties are these. 1. Transport conditions in the western districts and other localities are constraining production in some coal mines; 2. Many factors caused increased expenses in the first half year: price adjustments on materials alone have increased expenses by 160 million yuan, the price increase for electricity has cost an additional 50-odd million yuan, and other cost increases total 170 million yuan. In addition, there is no telling what other new cost increases may arise. All of these factors have created difficulty with financial targets. 3. Capital construction investments have not yet been fully implemented.

Yu Hong'en expressed confidence that despite these difficulties our efforts will enable us to complete the tasks of the general contract.

The Focus of Coal Industry Capital Construction

It has been learned that Yu Hong'en's first act after becoming minister was to send more than 200 administrative personnel to coal mines throughout the country to investigate the implementation of the general contracts. The minister, deputy ministers, and coal office and bureau heads personally went to the coal mines to study the situation and to learn about fresh contract-related experience, persistent problems and untapped potential.

According to Yu Hong'en, the first-hand information brought back by the investigation groups is being used to draft specific measures.

China has extremely rich coal resources; total known reserves total 749.6 billion tons. Last year China's output of raw coal was 789 million tons,

with a planned increase to 1.2 billion tons by the end of the century. Achievement of this objective is highly dependent on production-related construction in the next few years.

In order to save funds and obtain economic benefits as rapidly as possible, in the future the focus of capital construction in the coal industry will be on the expansion and renovation of existing coal mines and the utilization of untapped potential. The best of the new mines on which construction has begun will be selected for development, and preference will be given to low-investment, quick-completion, high-output projects. In addition, we must increase mechanization. By 1990 the proportion of centrally controlled coal mines using mechanized production will increase from the current 43 percent to about 60 percent.

When I asked about the problem of developing opencast coal mining, Yu Hong'en said that opencast mines are highly mechanized and highly efficient and give high output, but the most important thing is their safety: this is the direction of our coal industry's development. He also stated that because of excessive one-time investments, China's coal output from opencast mines is only 4 to 5 percent of the total coal output of the nation's centrally controlled coal mines, but by 1990 their share will increase to about 10 percent.

Imported Funds, Advanced Technology, Equipment and Processes

The conversation turned to foreign cooperation in the development of China's coal industry. Yu Hong'en stated that in the Seventh Five-Year Plan, whose implementation will begin next year, the coal departments have two important tasks: one is to increase output by 40 million tons of coal a year and to reach an annual output of 1 billion tons by 1990, and the other is to accelerate modernization of the coal industry and to institute effective deep processing and comprehensive utilization of coal. To accomplish these two tasks it will be necessary to open up further to foreign countries and to import foreign capital and advanced technologies, equipment and processes. He said that during the Seventh Five-Year Plan the construction of joint Chinese-foreign projects will develop on all fronts. In addition to the Antaibao opencut mine in Pingshuo, Shanxi, which is being constructed as a joint capital venture with the United States, and the Bailong Mine in Huo County, Shanxi, being built in cooperation with Romania, during the Seventh Five-Year Plan period the Jining No 2 coal mine in Shanxi, a joint project with the United Kingdom, and the Donghuancha Mine in Kailuan, a joint project with West Germany, will be constructed. The funds provided by the World Bank for the Changcun Mine in Lu'an, Shanxi, became available on 20 July while the World Bank loan for the Chengzhuang Mine in Jincheng, Shanxi, will begin producing results during the Seventh Five-Year Plan period. China will also import new foreign technology and new equipment to correct the coal industry's backwardness with regard to comprehensive utilization and deep processing. The Harbin Gasification Plant has signed a cooperation agreement with a plant in East Germany and will use the latter's equipment

and technologies for renovation. We are also planning foreign cooperation in building a chemical engineering plant that will process a million tons of coal a year.

I asked the minister to discuss economic and technical cooperation with overseas Chinese and foreign citizens of Chinese origin. He said that their economic and technical cooperation was welcome. China has extremely rich coal resources, which are widely distributed and cover the full range of grades, and many overseas Chinese and foreigners of Chinese extraction would like to invest in the development of coal production or to engage in economic cooperation in the field. We will be delighted to offer them favorable conditions. The scope for cooperation is broad. During the Seventh Five-Year Plan, in addition to necessary production-related construction, we will concentrate our efforts on effective technical renovation and the reconstruction and expansion of existing mines (as well as coal washing plants and coal machinery plants); some of these are reliable areas for cooperation. The projects on which cooperation is possible can be a mine or plant, or the technical renovation of some element of one. In addition, cooperation is welcome in coal gasification, processing and utilization, and coal mine safety technology. The forms of cooperation can be flexible and diverse; they are not rigidly prescribed. In recent years we have managed the Antaibo opencast coal mine in Pingshuo jointly with the United States, we have cooperated with a British company in installing a large-capacity excavator, we have engaged in compensatory trade with Romania in the Bailong mine, Huo County, Shanxi, and so on. These forms are all usable, or other methods that both sides regard as convenient and beneficial can be used, such as returning to China to lecture, engaging in short-term or long-term service within the coal system, and the like.

8480
CSO: 4013/36

COAL

CHINA'S LARGEST COAL FIELD FOUND IN NORTHWEST

OW121731 Beijing XINHUA in English 1652 GMT 12 Mar 86

[Text] Xi'an, 12 Mar (XINHUA)--A coal field with verified reserves of over 200 billion tons, the largest in China, has been found covering part of northern Shaanxi Province and the southern part of the Inner Mongolia Autonomous Region.

Officials here said today the coal in the 40,000 sq km field is also "of the best quality in China."

They noted that the actual reserves of the coal field may "greatly exceed what has been verified."

The new coal field faces Datong, a major coal producer, across the Huang He.

The officials expect that the coal field will reach an annual production capacity of over 35 million tons by the end of this century, and may even reach 10 million tons in the beginning of the next century, they added.

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CSO: 4013/93

COAL

SHANXI 1986 QUOTA: 210 MILLION TONS OF RAW COAL

HK260233 Taiyuan Shanxi Provincial Service in Mandarin 2300 GMT 24 Feb 86

[Excerpts] According to SHANXI JINGJI BAO [SHANXI ECONOMIC JOURNAL], at the provincial CPC Committee work meeting held before the Spring Festival, Vice Governor Bai Qingcai talked on the problems and situation concerning Shanxi's coal production, as well as measures to be taken to deal with them.

He said: In order to develop coal production, we must seriously implement the principle of setting the production quota in accordance with the sales volume. On the one hand, we must follow the state's requirements and build well the province's heavy industry and chemical industry bases. Based on this, we should formulate an overall and centralized plan and strengthen technological transformation so as to reach the output volume of 400 million tons by the year 2000. On the other hand, we must arrange production in the light of the capabilities of transport facilities and market demand, and strive to maintain a balance between output volume and the capabilities of transport facilities, and between output volume and sales volume. Therefore:

First, we must correctly estimate coal demand in the country. Generally speaking, for a long time to come, China will still face a shortage of energy resources. Supply and demand in coal will not reach balanced levels, and it will therefore be a seller's market.

Second, we must appropriately set the production quota, which is the key to maintaining a balance between output volume and the capabilities of transport facilities, and between output volume and sales volume. In 1986, the province's coal production quota assigned by the state is 210 million tons, of which 132 million tons is for locally run mines. The plan will become mandatory following the provincial planning meeting.

Third, we must strengthen the centralized transport, sales and management of coal products; and strive to maintain their prices at the market price level.

Fourth, we must consolidate all local coal mines, particularly township mines, across the provinces. All unauthorized coal mines run by individuals must be closed. Those unauthorized mines which are not necessarily to be closed must be suspended from operation for consolidation. We must strive to launch, in 1986 and 1987, a consolidation campaign for all local coal mines across the province.

Fifth, during the Seventh Five-Year Plan period, we should not, generally, develop any new mines except those in poor and remote areas. We should focus on technologically transforming the existing pits.

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CSO: 4013/87

NORTHERN BASE TO DOUBLE OUTPUT BY YEAR 2000

OW081924 Beijing XINHUA in English 1916 GMT 8 Mar 86

[Text] Beijing, 8 March (XINHUA) -- China's northern energy base should increase its share of the country's coal production from 40 percent to half by 2000, a high-level energy official said here today.

Guo Hongtao, director of the State Council's Energy Base Planning Office, said this means the five provinces an autonomous regions in the base would double their production to 700 million tons a year.

Speaking at a conference called by the energy office, Guo said other 15-year targets for the country's energy base include shipping 400 million tons of coal a year to other parts of China and reaching generating capacity of 40 million kilowatts and annual production of 900,000 to 1 million tons of high-grade aluminum.

According to Guo, the energy base -- consisting of Henan, Shaanxi, and Shanxi provinces and the Ningxia and [Inner Mongolian] autonomous regions -- has already "achieved great progress and become a mainstay of China's economy."

For example, he said, the area's coal output had increased from 227 million tons in 1980 to 354 million tons last year -- a jump of 55.7 percent compared to a national increase of 38.7 percent.

He added that construction of several new large-scale coal mines was proceeding well.

Over the past five years, Guo said, an additional 170 billion tons of coal reserves have been discovered in China, most of them in these five provinces and regions.

Guo also said a new railroad capable of transporting 100 million tons of coal a year is only one of several new lines under construction.

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CSO: 4010/39

FUJIAN MAKES BREAKTHROUGHS IN COAL PRODUCTION DURING SIXTH FYP

Fuzhou FUJIAN RIBAO in Chinese 22 Jan 86 p 2

[Article: "Pleasing Changes on the Coal Battlefront in Fujian Province, Three Breakthroughs Achieved During the Sixth Five-Year Plan"]

[Text] The coal industry in Fujian Province has relied first on policies and second on technical progress to guarantee an excellent momentum to sustained increases in output. Three new breakthroughs were achieved on the coal battlefront during the Sixth Five-Year Plan:

In 1985, raw coal output surpassed the major level of 6 million tons and created the best level in history. During the Sixth Five-Year Plan, raw coal output in Fujian grew at an average increment of 430,000 tons per year, which has put an end to the situation in which raw coal output hovered around 4.7 million tons for several years. The raw coal output plan handed down by the state for the Sixth Five-Year Plan was surpassed by 4.8 percent 2 years ahead of schedule.

Fujian has striven to export coal for many years and succeeded in doing so in 1985. The export task of 20,000 tons of raw coal was completed and $800,000 in foreign exchange was created for the state. In addition, more than 400,000 tons of coal were sold to Zhejiang, Guangdong and other provinces for the first time.

The long-term situation of deficits has been destroyed. After achieving profitability in 1983, profits in 1984 reached 5.49 million yuan. In a situation of price increases for pit timber and raw materials during 1985, the profit level of 1984 still was maintained.

The main reason for the ability to achieve these three breakthroughs on the coal battlefront is adherence to the principle of reform and invigoration. The implemented contractual responsibility for wage content per ton of coal in the enterprises, increased workforces without increasing total wage bills and reduced workforces without decreasing total wage bills and changed the old "big common pot" system of the past in which total wage bills were determined on the basis of a head count. This has motivated the initiative of the enterprises to increase output and reduce staffs. In 1985, enterprises

under provincial jurisdiction reduced raw coal production personnel by more than 2,000 and raw coal output completed the annual production plan 40 days ahead of schedule. This reversed the long-term situation of reliance on increasing the size of the workforce to raise output.

During the Sixth Five-Year Plan, the coal industry in Fujian has adopted more than 70 items of new techniques, technologies, materials and equipment, which has caused a further step toward modernization to be taken in coal production.

12539/12223
CSO: 4013/85

COAL

SHANXI ENERGY BASE GETS HIGH MARKS FOR PROGRESS

Beijing RENMIN RIBAO (OVERSEAS EDITION) in Chinese 3 Jan 86 p 3

[Article: "Good Progress in Construction of Shanxi Energy Resource Base Area--Coal Production Invigorates Machine-building, Electric Power, Chemicals, Communications and Other Industries"]

[Text] Great progress was made in construction of the Shanxi energy resource base area during the Sixth Five-Year Plan and an important contribution has been made to solving the coal shortage in China. According to statistics, the proportion of national coal output accounted for by the Shanxi energy resource base area has risen from one-fifth in 1980 to one-fourth in 1985. During these 5 years, Shanxi accounted for 4 of every 10 tons of increased coal output and it also provided 75 percent of the unified distribution coal shipped across provincial boundaries and supplied to the state. During the Sixth Five-Year Plan, the coal industry in Shanxi moved off the old route of simple reliance on central investments and state-run mines to redeploy with multi-channel capital collection and multilayer development. Large, medium, and small mines advanced together to create unprecedented development. The net increase in raw coal output in Shanxi over the 5-year period averaged more than 17 million tons, nearly double that of the Fifth 5-Year Plan. Output surpassed 200 million tons for the first time in 1984. Obvious changes also have occurred in the structure of output from large, medium, and small coal mines. Large coal mines, which are the focus of state investments, have depended mainly on importation of advanced technologies and equipment to transform existing mines and have continued to play a leading role as a "field army" in base area construction. Local coal mines and township and town coal mines, which have become known as "local armies" and "militias," have developed at the rate of a yearly increase in raw coal output of more than 10 million tons. Output from Shanxi's township and town coal mines in 1985 surpassed 90 million tons, three times the amount in 1980. They already have surpassed output from state unified distribution coal mines and have become an important force in coal production.

During construction of energy base areas, Shanxi has focused on outstanding industries and actively reinforced the electromechanical industries that serve the coal industry. This has greatly improved the capacity for local conversion and outward shipment of raw coal and invigorated the machinery, electric power, coal chemical, communications, transportation and other industries. During the past 5 years, Shanxi has engaged in trial development of 65 new varieties of

electromechanical equipment for coal mines and added more than 300 types of components. Output has grown 10-fold. Now, Shanxi can develop and produce everything from 500-horsepower high-power coal extractors to more than 100 types of imported electromechanical equipment and parts for coal mine machinery. A manufacturing system for electromechanical equipment used in coal mining has taken shape in a preliminary fashion. Further improvements in local conversion capacities for raw coal during the Sixth Five-Year Plan have permitted Shanxi to change its situation of simply shipping raw coal outside the province. Output of the chemical industry and metallurgical products like chemical fertilizer, coking coal, coal tar, calcium carbide, crude iron, iron alloys and other products that use coal as a raw material has grown year after year. Electric power output increased more than 20-fold during the 5 years, surpassing 2 billion kWh in 1985. Substantial development of coal production has been accompanied by growth in Shanxi's capacity to ship out coal. The out-shipment capacity of railways and highways has increased 70 percent and 2.6-fold, respectively, during the past 5 years. Shanxi shipped out a total of 550 million tons, an average annual increase of more than 12 million tons.

12539/12232
CSO: 4013/64

COAL

BIG YUNNAN STRIP MINE PROJECT AHEAD OF SCHEDULE

Kunming YUNNAN RIBAO in Chinese 22 Dec 85 p 1

[Article: "Coal Extraction and Transportation Project at Buzhaoba Strip Mine Goes Into Trial Operation Ahead of Schedule: Joint Investments by the State and Local Areas Guaranteed a Faster Pace at the Key Project"]

[Excerpts] On 20 December 1985, the third stage of the expansion project at the Xiaolongtan coal mine, the Buzhaoba open-pit coal extraction and surface coal transportation system, went into operation and trial production 3 months ahead of schedule. The raw coal from this mine is moved 4 meters per second by overhead belt conveyor directly to a pit-mouth power plant, the Xiaolongtan Power Plant No 1 generator, which has just gone into operation.

The Xiaolongtan coal mine is one of the largest open-pit mines in China and is formed of two extraction points at Buzhaoba and Xiaolongtan. The coal field contains reserves of 1 billion tons and the coal seams have an average thickness of 70 meters and a maximum thickness of 222 meters. These seams are buried at shallow depths and have loose capping strata. The open-pit extraction conditions are good and the stripping/extraction ratio is 1:1. The area has been included in key state construction plans and will become a large coal-power base area on China's southwestern frontier when matched with the pit-mouth power plant.

The Buzhaoba strip mine coal extraction and transportation production system project runs for a total length of 2,300 meters. The primary production links include a coal extraction trestle hopper, a coal storage yard, a sifting plant, a car loading storehouse and 26 belt conveyors. Bucket excavators, rotary loaders, earthmovers and other equipment developed for the first time in China are being used in the pit. This equipment and facilities form a high efficiency modernized continuous technique production line. At present, the pit is in the process of expanding and production still is done using single bucket excavators, trucks and other transitional measures. After the entire third stage expansion project goes into full swing, all the main equipment like trains, winches, single bucket machines, trucks will be replaced completely. This will raise productivity considerably and annual lignite output will increase from 900,000 tons to 2.4 million tons. The end point of coal transportation in this system is connected to the coal transportation trestle of the Xiaolongtan Power Plant to form a 6,400 meter long corridor like an enormous live dragon that passes over mountains and rivers for close integration of coal and power.

The coal transportation and production system is the main porject in the third stage expansion at the Buzhaoba strip mine. The Ministry of Coal Industry and Yunnan Province each invested 40 million yuan to begin construction in 1983 and the plan is for basic construction and operation to be achieved in March 1986. During the construction process, the Expansion Direction Department has focused on four important construction links in the project (the belt conveyor bridge over the river, the sifting and dressing plant, the coal storage silo and the coal storage yard). In addition, it organized personnel to implement the conditions of equipment delivery and create the conditions for accelerating project construction. Large numbers of cadres from the Yunnan Coal Mine Capital Construction Company, the Shenyang Mining Machinery Company, the Railway Construction Company, the Kunming Tractor Plant, the Kunming Metallurgical Prospecting Company, the Xiaolongtan coal mine and design units which had responsibility for project construction and production of the primary equipment overcame the complex geology, topography and terrain and the poor construction schedules and other difficulties and pressed on with construction to complete it 3 months ahead of schedule and go into trial production.

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CSO: 4013/64

REFORM SPURS YUNNAN'S COAL INDUSTRY

Kunming YUNNAN RIBAO in Chinese 17 Jan 86 p 1

[Article by Qian Liangzuo [6929 5328 4373] and Zhang Zhongliang [1728 0112 0081]]

[Excerpt] Sichuan Province's coal production surpassed the target set by the Sixth 5-Year Plan, with an average annual increase of 1.18 million tons and up by 5.87 million tons over the period of the Fifth 5-Year Plan.

While striving to fulfill coal production quotas, the provincial coal industry department adhered to the principle of simultaneous development of both extraction and excavation, vigorously stepped up tunneling and achieved remarkable results in readjusting mining work. The "three coal-mining figures" registered by collieries directly under the department during the Sixth 5-Year Plan increased by 12.4 percent, 15.2 percent, and 98.9 percent, respectively, over that in the latter part of the Fifth 5-Year Plan, greatly relieving the strain between extraction and excavation and laying a good foundation for continued stable yield. Capital construction investment in the coal industry during the Sixth 5-Year Plan period increased by 41 percent over that in the Fifth 5-Year Plan period. Four new pits were put into production, adding 180,000 tons in production capacity. A coal dressing plant was completed with 450,000 tons of new capacity. Work in geological prospecting and planning both overfulfilled plans. In the 4 years from 1981 through 1984, the province's coal industry completed a total of 102 technical transformation projects. Through the technical transformation, the coal mining equipment enterprises made new progresses, bringing simultaneous increases in output value, output and profit as well as taxes and profit turned over to the state. State-operated prefectural and county coal mines added 370,000 tons in new capacity.

Following the principles of "simultaneous development of large, medium-sized, and small enterprises" and "allowing the water to run," coal mines run by prefectures, counties, and rural townships in the province grew rapidly during the Sixth 5-Year Plan period, from some 2,000 mines in 1980 to more than 6,000 in 1985. Coal output in 1985 increased by 37 percent over that in 1980.

The safety conditions of coal mines in the province have improved considerably. State-operated coal mines have basically brought serious accidents under control, with a death rate per 1 million tons of coal mined close to the control index for the nation's coal mines whose products are distributed under the unified state plan and the number of accidents involving serious and minor injuries greatly reduced.

12802/9365
CSO: 4013/69

SICHUAN IMPROVES COORDINATION BETWEEN COAL PRODUCTION, RAIL TRANSPORT

Chengdu SICHUAN RIBAO in Chinese 29 Jan 86 p 1

[Article by Niu Bo [3662 3124]: "Sichuan Increases Coal Output, Rail Transport Capacity and Electric Power Production"]

[Text] In a spirit of reform, the Sichuan Railway, Mining and Electricity Cooperation Commission has been strengthening horizontal economic ties vigorously between different industries and enterprises, promoting intersector cooperation, enhancing working efficiency and improving economic results. The result is a simultaneous increase in coal output, rail transport capacity and electric energy production. For the province as a whole, raw coal output, rail coal freight and the production of six major generating plants increased 19, 8, and 32 percent respectively in 1985 over 1984.

To resolve such problems as the intense pressure rail transport has come under, imbalances in coal supply and demand, and electricity shortages, the Railway, Mining and Electricity Cooperation Commission last year put forward a slogan--"put transportation at the service of coal, put coal at the service of electricity, do a good unloading job to facilitate transportation, strengthen horizontal economic ties between enterprises and improve macroeconomic results"--and took some positive measures.

In light of the province's major thermal power plants' heavy responsibility for electricity generation and enormous demand for raw coal, the cooperation office adopted unified planning and centralized management to ensure coal availability for power plants; throughout 1985, no thermal power plant in the province experienced a coal shortage. Furthermore, zeroing in on coal overstocking in certain areas, the cooperation office mounted a series of blitzes to get rid of it. Hardly had 1985 begun when it launched a 40-day drive to remove 80,000 tons of coal sitting idle in Zhaojiaba and Daichiba. A similar operation in April took care of another 40,000 tons of coal kept in stock in the Jingang coal mine in 4 months. During August and September, the office did another rush job to transport the coal stocks in the four mining bureaus of Songzao, Yongrong, Huaying Shan and Furong, thus basically completing the transport of coal overstocked in the entire province.

The commission last year also tackled aggressively the shipment of coal out of the province by convening a railway junction cooperation conference to which it invited the representatives of railway bureaus and economic and planning commissions in other provinces. That made possible the "export" of 1.15 million tons of coal by Sichuan to the rest of the nation last year.

12581/8309
CSO: 4013/88

COAL

NINGXIA LOCAL MINE OPERATIONS BOOMING

Yinchuan NINGXIA RIBAO in Chinese 23 Nov 85 p 1

[Article by Li Shuangjin [2621 7175 6855]]

[Text] The number of licensed medium and small coal mines in Ningxia has grown to 109. From January to October [1985], 2.3 million tons of raw coal were produced. The raw coal production is 30 percent higher than the same period last year and is 23.7 percent of all the coal produced in the region.

Ningxia has rich coal resources; the wide distribution and the good mining conditions are economic assets. Due to the restraints of leftist policies in the past, the development of local coal mines has been slow. The advantageous resources have not been utilized and the supply of coal for industrial and agricultural production and residential usage was unable to be met. In recent years the People's Government of the autonomous region followed the directives of the Central Committee to relax the restrictions and to speed up the construction of local coal mines. The economic committee and the coal office of the autonomous region made an effort to upgrade the technology of the region-operated coal mines and to invest in the construction new mines. They followed the guideline of "unified planning, sensible layout, and safe production" and actively supported mining activities of the villages and townships and encouraged the peasants to engage in mining activity by pooling their funds. Developments at the various levels quickly led to a number of small coal mines. In 1985 alone, 51 new small mines were built.

When the peasants raise money and start small local coal mines, the modest investment and the short construction time produce quick results. Construction of the coal mine at Ciyaobao, Lingwu County, began in the middle of January and its production system was completed by the end of August. They have netted more than 110,000 yuan in only 2 months of operation. The eight villages outside Shizhuishan started 18 small coal mines and the mining income has already become a major economic force in the village and township enterprise. About a dozen small mines in the southern mountains have solved the coal shortage problems for the peasants.

The coal office of the autonomous region adheres to the practice of "relaxing restrictions but not causing confusion and managing but not stifling activity." They have actively provided technical service for the peasants and helped them

solve practical problems. In the second half of 1985, the coal office has also stopped some unplanned mining and ensured a healthy development of local coal mines by protecting state resources and requiring safe production.

9698/13045
CSO: 4013/53

HUNAN SIXTH FIVE-YEAR PLAN PRODUCTION FIGURES RELEASED

Changsha HUNAN RIBAO in Chinese 7 Jan 86 p 1

[Excerpts] In the Sixth Five-Year Plan, encouraging results were achieved on Hunan's coal front. Total raw coal production in this 5-year period came to 134.5 million tons, a 13.8 percent increase over the Fifth Five-Year Plan period. This reverses a long-standing situation of coal supplies failing to meet demand.

Coal front workers had placed a priority on reform, implementing various forms of economic contracts.

From 1980 to 1985, extraction and mechanization increased by 30 percent and 20 percent respectively. The number of raw coal production workers decreased by an average of 1.4 percent a year but productivity of the personnel rose by an average of 2.5 percent a year.

Small-scale village and township mines played an enormous role during the Sixth Five-Year Plan. These small-scale mines grew to more than 1,700 during the Sixth Five-Year Plan and each year produced more than 40 percent of the entire province's raw coal output.

/8918
CSO: 4013/86

COAL

DATONG MINING BUREAU REPORTS RECORD OUTPUT

Beijing RENMIN RIBAO in Chinese 22 Dec 85 p 1

[Text] According to the China Coal Report, the coal output of the Datong Mining Bureau reached 30 million tons between 1 January and 21 December 1985. The Bureau has become one of the few in the world and the first in China among the big coal producing cooperatives to reach the annual output of 30 million tons.

The quality of Datong coal is exceptionally good with a heat content as high as 8,000 Kcal, which is 1.4 times the national average. Therefore, 30 million tons of Datong coal is equivalent to 42 million tons of average coal. It is one of the best coals for power generation and is referred to as "prosperity powder." Without opening up new mines, the Bureau has maintained an average annual increase of 1.6 million tons for the past 4 years, and the estimate for [the 1985] output is 30.8 million tons. It has played a significant role in alleviating the national energy shortage and enhancing the development of the national economy.

In recent years, the Bureau has kept reform as its highest priority and brought the initiative of its vast staff into play to realize their full potential and to continuously improve economic results. It has lead the nation in coal production and in revenues remitted to higher authorities. The comparative cost has been decreasing yearly, and productivity has been steadily rising. The individual productivity has reached 1.6 tons this year, which is one of the highest among the big bureaus with an annual output of over 10 million tons. There has been an ample increase in output and a small increase in the number of workers. In some mines the output has increased while the number of workers decreased.

The Datong Bureau has not added any new mines for the past 12 years, but the net growth in annual output is over 17 million tons, equivalent to adding a big mine every year. The key is the technological transformation of old mines to promote expanded reproduction. In the past 6 years alone, 149 million yuan have been invested to improve the ventilation, transportation, lifting, sifting, and surface loading systems, with a subsequent increase in overall production capacity by 5.17 million tons. Thus, the bureau has achieved the goals of low input, high output, rapid output increase, and good economic results.

Relying on technological advancements and mechanization, the Datong Bureau has reached the new plateau of 30 million tons in annual output, an awesome performance. The entire Bureau has been actively involved in scientific research and technological renovation, and 633 of the projects have received awards in the past 6 years. The Bureau owns 33 sets of fully mechanized, comprehensive mining equipment and 26 sets of mechanized excavators. The degree of mechanization is being raised to 75 percent, and many new national records are being set in mechanized mining and excavation.

Running both large and small mines is another experience gained in the Bureau's strategy of setting its sight inward to fully realize its potential. Its people have exploited the advantages of big mines in terms of manpower, technology, materials, equipment, and resources and operated a total of 49 small mines through various arrangements such as sole ownership, collective ownership, and cooperative ventures with townships. So far this year over 2.4 million tons of coal have been mined. These small mines are mining solely the peripheral coals or the residual pillars of coal. They cost the state nothing but give the state an additional output equivalent to that of a large mine.

The Datong Bureau produces both coal and talented personnel. A team of workers having great vision, well-trained in modern technology, and with exceptional competency is fast emerging. They are striving to make more contributions and to reach the new plateaus of producing 40 million tons annually by 1990 and 50 million by the end of the century.

12922/12624
CSO: 4013/55

DATONG ACHIEVES HIGH OUTPUT THROUGH REFORMS

Beijing RENMIN RIBAO in Chinese 22 Dec 85 p 1

[Article: "Face Reforms in Demanding Coal--How the Datong Mining Bureau Was Able to Achieve Yearly Output of 30 Million Tons"]

[Summary] In 1985 the Datong Mining Bureau gained a major victory, achieving the strategic goal of annual raw coal output of 30 million tons!

When the good news arrived, the State Council sent a congratulatory telegram to them for having contributed to developing energy resources and promoting development of the national economy.

I. Looking Inward, Self-Transformation

The Datong Mining Bureau has not added a single new shaft since doubling its original design capacity in 1979, so how is it possible that output has grown stably at an annual rate of 1 million tons a year? Bureau director Comrade Ma Jie [7456 2638] said by way of introduction: "We depended mainly on old mines, looking inward and self-transformation." Work on self-transformation in the Datong Mining Bureau entered a high tide in 1980. First, they carried out surveys and measurements of 12 links at each mine that included geological structures, coal strata reserve conditions, mine transportation, lifting, sifting, cart installation, ventilation, water drainage, electricity supplies and so on. Based on the characteristics of each mine, they formulated technical transformation plans and practical measures to coordinate and match up each link at each mine and improved production capacities.

Weakness in underground transportation was the primary factor affecting production. The bureau installed a series of underground conveyor belts in four mines and greatly improved transportation conditions. During technical transformation, the Yungang Mine installed 12 conveyor belt machines and increased its underground transportation capacity from 2.54 million tons to 4.73 million tons, thus realizing the potential of the old mine.

The bureau spent more than 149 million yuan in capital for technological transformations over the past 6 years. Capacity, the comprehensive link in raw coal output, increased from more than 23 million tons in 1979 more than 31 million tons in 1985.

II. Import Technology, Focus on Digestion

Technical imports were the primary factor in the development of production in the Datong Mining Bureau. By 1985, the level of mechanization in the bureau had reached 75 percent and the degree of mechanization in tunnelling and loading reached 75 percent, up by 25 and 18 percent over 1979, respectively.

The bureau began inporting excavating equipment from foreign countries in 1974 and has added 33 sets of imported comprehensive equipment and 26 sets of integrated tunnellers to date. Comprehensive extraction equipment imports amounted to only 20,000-plus tons in 1979 but approached 50,000 tons in 1984, and efficiency rose by 86 percent.

S&T personnel in the Datong Mining Bureau have played an important role in the area of excavation mechanization. In the past 6 years, the bureau has completed a total of 633 scientific research and technical renovation projects that have been effective in promoting technical progress and the development of production.

III. Make the Best Use of Available Resources, Allow the Large and Small to Advance Together

Every year some old, weak, sick and disabled employees of the Datong Mining Bureau retire from primary production positions and a large number of their relatives and children need jobs each year. They employed the advantages of the large mine in manpower, technology, materials, equipment, resources and so on to restore and utilize abandoned equipment and pit shafts in a major effort to develop small coal mine production. They adopted mine operation, collective operation and joint mine-township operation when setting up the small coal mines and assigned retired technical workers and some management personnel as technical advisors. To date, the bureau has set up 49 small coal mines with an actual production capacity of more than 2.1 million tons.

12539/12232
CSO: 4013/64

SUGGESTION FOR SHAANXI'S COAL DEVELOPMENT STRATEGY SUMMARIZED

Xi'an SHAANXI RIBAO in Chinese 26 Feb 86 p 3

[Article by Zeng Shouzhong [2582 1343 0022]]

[Text] In general, Shaanxi's coal resources are vast, of good quality and are buried at shallow depths; total reserves come to more than 230 billion tons, placing the province in fourth place nationally. The quality of coal in the Shenfu fields is exceptionally good. If 200 million tons of coal are produced a year, the supply could last for 500 to 1,000 years.

Although Shaanxi's coal reserves are enormous, the actual output is small. For example, in 1982 the entire province produced only 20.176 million tons, a mere 3 to 4 percent of the national total, a very poor showing compared to the amount of reserves. Of this 20.176 million tons, the province itself consumed over 15 million tons and shipped out only 5.154 million tons. There are many factors contributing to this backward situation, but I believe the principle cause is the shipping bottleneck at the old mines. Because of this unresolved shipping problem there is little incentive for new mines to develop.

When a master plan for strategy is drawn up, provincial experts agree that "coal" and "roads" should be bound together but today's big problem-- "road" construction-- must be addressed; much time is needed -- 10 to 15 years -- and a lot of money too -- 3 to 4 billion yuan. I think that Shaanxi's coal development strategy should first be to construct pit-mouth power plants. Selling electricity is cheaper than selling coal -- about one-third as cheap. The time factor is shorter -- about one-third to one-fourth that for coal. The benefits are also greater. Our neighboring province, Sichuan, and other regions are hard-up for electricity. As soon as coal is converted into electric power, there is a ready market for it.

CSO: 4013/96

COAL

ON-SITE CONVERSION EASES TRANSPORTATION BOTTLENECKS

Taiyuan SHANXI RIBAO in Chinese 25 Nov 85 p 2

[Article by Wang Jiabi [3769 1367 3880]]

[Text] Changzhi County has rich coal resources. To date, the county has built 150 small coal mines which produce 3 million tons of coal per year. The income from coal is more than 40 percent of the total income of village and township enterprises.

The continued development of coal production has revealed problems in the transportation and sales of coal. Our state-allocated railway transportation quota is only 400,000 tons per year. Even after we constructed highways and helped the peasants purchase vehicles, the maximum highway transportation capacity of coal is still only 1.2-1.3 million tons. Before 1983, even though the annual coal output was only 1.5 million tons, a large amount of coal still remained at the opening of the main shafts and was eventually destroyed by spontaneous combustion or washed away by floods. Such great economic losses dampened the enthusiasm of the peasants engaged in mining.

Early last year, some members of our county party committee and county government made a fact-finding survey of the production and transportation of coal at the village and township level. We found a common feature shared by the 20 villages and townships in the county; they were all in the position of developing on-site conversion of coal into power. The mountainous southeast region also has iron ore and bauxite, and can be developed into a metallurgy and calcination base. The northwestern region is flat and close to the cities, the region may be developed into a base for construction materials (mainly bricks) and coal processing. After we understood the situation, we made a firm decision to develop on-the-spot conversion of coal. The county then started 610 village and township enterprises for coal conversion and modified 12 state-operated and two light industry enterprises. Together with the coal consumed by the local population and the plant and mine units, 1 million tons of coal (1/3 of the coal production) can be transformed on the spot every year.

Our first approach is to mobilize the peasants to develop individual enterprises with funds raised on their own, or to jointly develop combined enterprises. One thousand peasants in the county raised 1 million yuan and started more than 400 coal transformation enterprises including metallurgy, chemical

and coal processing operations. Our second approach is to develop collective enterprises as joint efforts of the villages and townships, and then contract the operation out to the peasants. The third approach is to enter joint business with other countries and cities. Based on the advantages of coal, iron ore and bausite, Jiazhangxiang joined Changzhi city in Hebei and others in 1984 and built a steel mill with a design capacity of 10,000 tons and a refractory material plant to convert a substantial amount of local coal. The fourth approach is for business departments to make the investments. County, village and township bureaus have specially formed humic acid companies to convert 30,000 tons of coal per year. At certain places, coal transformation enterprises were planned concurrently with the mining development. Contracts were entered with other units to exchange coal with other raw materials for developing the coal conversion enterprise.

While working on the development, we have also worked on the technological improvement of existing and newly established enterprises to accelerate the conversion of coal and broaden the production. Changzhi county has a good base of state-operated and light industries, including more than 10 chemical fertilizer, sulphur, paper and steel mills. These are all direct or indirect coal transformation enterprises. In this regard, our guideline is to expand production and improve our coal transformation capability while maintaining product quality and sales. The state-operated chemical fertilizer plant in the county used to be losing money, and management difficulties led to production halts. There were suggestions to close down the fertilizer plant, but we believed that the plant should not only remain open but should be expanded because it provides fertilizer for the peasants and converts local coal on the spot. We therefore made a serious effort to restructure the plant, and increased the fertilizer output to 2,800 tons per month, while the production system alone converts 6,000 tons of coal per month.

9698/13045
CSO: 4013/53

COAL

BRIEFS

NEW NORTHEAST FIELDS FOUND--Changchun: 11 Mar (XINHUA)--Two new coal fields, with reserves of 500 million tons and 50 million tons respectively, have been found in northeast China. The Dashiqiao coal field is near Jixi city, Heilongjiang province, and the Jiudaoling coal field, in Yixian County, Liaoning Province. They were found by geologists of the Northeast China and Inner Mongolia Coal Industry Joint Company. Dashiqiao, with lignite seams averaging ten meters in thickness, covers 60 sq km, according to a company spokesman today. [Text] [Beijing XINHUA in English 1434 GMT 11 Mar 86 OW] /7358

FUJIAN 6TH FYP PRODUCTION--Fujian's coal industry achieved great progress during the Sixth Five-Year Plan. The province's coal industry developed at an annual growth rate of over 8 percent in the past 5 years, fulfilling the Sixth Five-Year Plan 2 years ahead of schedule. Last year, Fujian produced over 6 million metric tons of raw coal, an all-time record. [Summary] [Fuzhou Fujian Provincial Service in Mandarin 1130 GMT 14 Jan 86]

HUAIBEI CONSTRUCTION UPDATE--The Huaibei coal base has built three large and medium coal mines and two large coal dressing plants with a total designed annual raw coal production capacity of 3.6 million metric tons and annual raw coal dressing capacity of 3 million metric tons. Seven new coal mines now under construction have a total designed annual raw coal production capacity of 5.7 million metric tons and annual raw coal dressing capacity of 4.2 million metric tons. With the completion of new mines and renovation of existing ones, coal output of the base is expected to double by the end of the century. [Summary] [Hefei Anhui Provincial Service in Mandarin 8 Jan 86 OW]

/12929
CSO: 4013/92

FIVE-YEAR CRUDE OIL OUTPUT FIGURES PUBLISHED

Beijing RENMIN RIBAO (OVERSEAS EDITION) in Chinese 3 Jan 86 p 1

[Article by Reporter Zhang Heping [1728 0149 1627]: "Crude Oil Output in China Over the Past 5 Years Exceeded 540 Million Tons; Output in 1985 Surpassed 120 million Tons"]

[Text] China's petroleum industry has entered a new period of development during reforms. Total crude oil output in China during the Sixth Five-Year Plan exceeded 548 million tons and more than 51 million tons of commodity oil in excess of plans were supplied to the state. Crude oil output in 1985 reached 124.8 million tons, up by more than 10 million tons over 1984 and creating the highest level in history.

Over the past 5 years, crude oil output in China has grown at an annual rate of 5.3 percent. Daqing oil field has achieved the goal of sustain stable and high output over a 10-year period. The rate of growth in eight oil fields in China was up by 20 percent over 1980, and the rate of growth was up by more than 40 percent in Shengli, Liaohe, Zhongyuan, and other oil fields. Annual output at the Shengli oil field has risen to more than 27 million tons.

A new situation has opened up in petroleum prospecting, and geological reserves have increased substantially. More than 30 rather large zones of rich oil and gas accumulation were discovered during the Sixth Five-Year Plan and newly proven reserves are up by more than one-half over the Fifth Five-Year Plan. This has caused the rate of growth in reserves to exceed that in output. Several large oil polls with reserves in excess of 100 million tons have been discovered in the Shengli, Liaohe, and other oil fields in eastern China. New oil strata have been discovered beneath the already developed oil field in the Karamay region in western China. High-output oil and gas pools have been discovered in the southern part of the 560,000 square kilometer Tarim Basin, and high output oil and gas wells have been drilled in the northern part.

There have been new advances in petroleum prospecting and development technologies. During the Sixth Five-Year Plan, a total of 20 key national scientific and technical problems were tackled and 398 advanced S&T research topics were completed.

Economic results in the petroleum industry have improved. According to statistics, the petroleum industry turned over 32.2 billion yuan in profits, taxes and energy resource funds to higher state authorities during the 5-year period. This is the equivalent of 2.49 times the amount of state investments over the same period, and it has made new contributions to the four modernizations.

12539/12232
CSO: 4013/64

OIL AND GAS

OIL PRICE SLUMP COULD POSTPONE MAJOR DEVELOPMENT PROJECTS

HK070600 Hong Kong SOUTH CHINA MORNING POST (BUSINESS NEWS Supplement) in English 7 Mar 86 pp 1, 3

[Article by Olivia Sin]

[Text] The continuing slide in world oil prices will dampen foreign companies' interest in joining China's exploration programs, according to an energy expert.

Mr Barry Fenton, managing director of Energy Projects (SE Asia) Ltd., a consultancy firm, told BUSINESS NEWS that oil companies seeking new acreage from China are likely to slow down the negotiation process.

The companies will also take advantage of the current situation and press for better terms and more concessions.

Mr Fenton said the price collapse is causing major concern to Chinese leaders who are eager to strike large oil finds which will help to solve the country's energy shortage and sustain its level of crude exports.

Observers said it is likely foreign oil companies will continue their negotiations for exploration contracts under the second round which is still in progress, but may put off signing contracts at this stage.

Apart from hindering exploration, the slump in oil prices may also lose China up to U.S. $2 billion in oil revenue this year, leading to postponement of major development projects.

No company has yet decided to cancel its oil exploration programme in China despite the fact that some production projects have been stalled in other parts of the world.

But industry sources said companies are likly to delay their work schedules in China until they see improved prospects for oil prices.

In particular, they are likely to postpone decisions on whether to upgrade drilling projects to the development stage.

It is uneconomical to develop medium-sized fields when the price of oil drops to U.S. $12 a barrel or below, the sources said.

On Tuesday, prices of the main grades of American and British oils fell below $12 a barrel from a high of $30 at the end of November, although showing a slight recovery on Wednesday.

In addition, high operating costs in China and the poor drilling results experienced so far are not helping to stimulate oil companies' interest in the area.

Oil industry sources said China will have to make more concessions in order to attract oil companies to drill both offshore and onshore. The Chinese have already softened the terms for offshore contracts awarded under the second round.

So far, six of these contracts have been awarded to companies including Esso, Phillips, ACT group, Amoco, Cluff, and a Japanese consortium. Observers doubted whether more contracts will be concluded in the next few months in view of the "ridiculously" low oil price.

It is understood oil companies are generally asked to shoulder a smaller drilling commitment and fewer training expenses under second-round contracts.

Some sources said the companies are required to drill only one or two wells in each contract area as opposed to three or four wells in the first-round contracts.

Drilling costs are estimated at U.S. $10 million for each well in offshore China.

"With less income, oil companies are unlikely to spend huge sums on exploration," one industry expert said.

China has opened 10 southern provinces to foreign oil companies and has started negotiating exploration contracts for the Subei basin in Jiangsu and the Baise basin in Guangxi.

Industry sources are confident two offshore development programs will go ahead as scheduled--Total Chine's appraisal trial development in Beibu Gulf and Atlantic Richfield's natural gas development in Yinggehai basin.

Total's field is scheduled to produce oil by mid-year and the gas field will start gushing by 1989.

Doubts linger on whether Esso will develop its "marginal find" in the South China Sea and it remains to be seen whether Phillips and ACT group, which have made encouraging finds, will decide to upgrade their operations to development stage.

The effects of the oil price decline may be reflected in China's 7th 5-Year Plan (1986-1990) due to be discussed at the National People's Congress later this month.

China is unlikely to be able to make up for its loss in oil revenues by boosting other exports in the short term.

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CSO: 4010/41

OFFICIAL CLAIMS FALLING PRICES WILL NOT AFFECT CHINA'S OUTPUT

HK150840 Beijing ZHONGGUO XINWEN SHE in Chinese 1351 GMT 13 Mar 86

[Text] Beijing, 13 Mar (ZHONGGUO XINWEN SHE)--Tan Wenbin, vice president of the Chinese Petroleum Association and director of the Development Department of the Ministry of Petroleum Industry, today said: The present drop in petroleum prices will not seriously affect China's oil production. At present, China's oil output is still not enough to meet the demand at home. This year China will maintain the same oil export level as last year. That is, it will export 30 million tons of oil. It will not increase oil exports in view of the price drop on the world's oil markets.

He said: During the Seventh Five-Year Plan, China will substantially increase its oil output. It is expected that the oil output will increase to 150 million tons in 1990 from 125 million tons in 1985. The additional oil output will mainly be produced by some onshore oil fields in eastern China. The Daqing oil field will maintain its annual output of 50 million tons until 1990. The Shangli oil field will be developed into a second Daqing oil field in the Seventh Five-Year Plan period. At the same time, three new oil production bases will be built in the region of Bohai Bay.

Tan Wenbin made the above remarks when briefing reporters on an international exhibition of petroleum equipment and technology. The exhibition will open tomorrow and will display petroleum equipment and technology of more than 10 countries.

/9599
CSO: 4013/93

MAOMING BECOMES MAJOR PETROLEUM PRODUCTS EXPORT BASE

Beijing RENMIN RIBAO (OVERSEAS EDITION) in Chinese 22 Nov 85 p 3

[Article by Cai Zhan [5591 3277]]

[Text] The Maoming oil field, built on wasteland in the 1960's, is becoming one of China's important petroleum products export bases. Maoming now produces more than 700,000 tons of petroleum products per year and exports one-seventh of China's petroleum products.

After 20 years of hard work, the Maoming oil field has become a major oil refinery enterprise with a large refining capacity and complete technological capability and transportation and sales system. It can produce more than 100 petroleum products and can conveniently export the products at nearby Zhanjiang. In 1979, the government decided to build Maoming into a petroleum products export base and permitted Maoming to import a complete modern hydrogen cracking facility from Japan. By the end of 1981, the imported facility was put into production and the oil refinery technology and product quality were improved. The company has also imported a paraffin forming facility so that the quality, specification, and packaging of its paraffin products will meet the international market needs in 20 countries and regions. At the same time, the company has also implemented and perfected a set of quality improvement procedures using its own funds. In the area of comprehensive quality control, the company adhered strictly to petroleum export product inspection standards to assure quality and to to strengthen its competitiveness on the international market. Aviation fuel is the company's strong suit, and more than 100,000 tons are exported per year. Because the products are produced using advanced technology, they have twice been awarded gold medals by the state and enjoy a good reputation in Hong Kong.

Based on the needs of the international market, the Maoming Petroleum Industry Company has been continuously improving its product quality and expanding its product variety. The benzene products produced by Maoming are important organic chemical raw materials and are subjected to rigorous quality control. Based on the accepted international standards, Maoming has improved its technology and reached the advanced product quality. Toluene and xylene have both been awarded silver medals by the state and enjoyed favorable reception in Japan. The company has also test produced six types of lubricating oils and other oils, achieving international standards. Two of these products are exported to the

United States and Mexico and five of these products are supplying the Chinese Sun Oil Company, a Sino-U.S. joint venture. The number of oil products of Maoming has increased from four or five to more than 20. The company accounts for about one-half of China's petroleum product exports to Hong Kong.

9698/13045
CSO: 4013/54

TASKS OF PETROCHEMICAL CORPORATION DURING SIXTH FIVE-YEAR PLAN COMPLETED

Beijing GUANGMING RIBAO in Chinese 10 Dec 85 p 1

[Article: "Twenty-four Key State Tasks of the China Petrochemical Corporation During the Sixth Five-Year Plan Basically Have Been Completed"]

[Text] The year 1985 was a great one for achievements in key S&T tasks for the China Petrochemical Industry Corporation. They were responsible for 24 key state tasks during the Sixth Five-Year Plan and, with the exception of a small amount of work that must be carried over into 1986, all of the remainder has been completed. Ten items have been included by demand in industrial production and six have created yearly profits in excess of 10 million yuan.

Reforms have promoted integration, and many key achievements were completed through integration. Domestically produced "400,000-ton hydrocracking facilities" are the result of the Corporation's Petrochemical Industry Scientific Research Academy and the Fushun No 3 Petroleum Refinery jointly tackling key tasks. These facilities are made up of new technologies and new equipment that have been completed and gone into production and made it possible for the Fushun No 3 Petroleum Refinery to increase its taxes and profits by nearly 60 million yuan. Part of the taxes alone could repay all the investments and loans. The reforms greatly improved the initiative of scientific research units to serve production. To compete with foreign countries, the petrochemical Industry Scientific Research Academy had called for self-development of isomerized dimethylbenzene catalyst at advanced international levels as a substitute for the large amount of imports used in China. This new produce was tested successfully in production facilities at the Qianjin Chemical Refinery in September 1985.

12929/12539
CSO: 4013/79

OIL AND GAS

PETROCHEMICAL CORPORATION REPORTS ANNUAL FIGURES

Beijing RENMIN RIBAO (OVERSEAS EDITION) in Chinese 5 Dec 85 p 1

[Article by Chen Ling [7115 3781]: "Petrochemical Corporation Sustains Steady Growth in Three Consecutive Years"]

[Text] The Chinese Petrochemical Corporation has processed 83.69 million tons of crude oil in 1985, 2.3 percent more than the amount processed in the same period last year. The total value of production is 30 million yuan and the revenue generated is 14 billion yuan; these are respectively 9.4 percent and 10 percent more than last year's level.

The figures are given by Chen Jinhua [7115 6939 5478], General Manager of the Chinese Petrochemical Corporation, in the third meeting of the managers and plant directors held today at the company headquarters.

The enterprises under the jurisdiction of the Petrochemical Corporation have all adopted the term system for the director and manager positions, some are also trying out the hiring system. Eighteen enterprises (50 percent of enterprises under the Corporation's jurisdiction) have implemented the director (manager) responsibility system. The corporation has broadly delegated power in production, business management, and personnel and property management to the various enterprises, especially the larger enterprises with revenues above 500 million yuan, to strengthen the vitality of the enterprises.

Also contributing to the gains in the economic benefits of the corporation, according to Chen, is the coordination and cooperation among the refinery, fertilizer, petrochemical and synthetic fiber enterprises in the allocation of raw material and work force.

Chen also said that the corporation has also completed eleven engineering projects in 1985. Good progress has been made on the seven priority projects of the state. The chemical fertilizer companies in Zhenhai and Urumqi and the phase II engineering of the Shanghai Petrochemical Plant have all come online ahead of schedule, resulting in a savings of 100 million yuan. The corporation is expected to produce 6.58 million tons of oil products and generate U.S. $1.5 billion of foreign exchange.

In 1985 the corporation has also signed 68 economic and technological contracts with foreign companies and has established four Sino-foreign joint ventures, (Zhongkang, Huakai, Huafu, and Hualu) and Gaoqiao and Dalian international trade companies, and Liaohua United Trade Company.

Recently, the Zhongshen Petrochemical Company, Ltd. has opened for business in Shenzhen. A lubricant plant run by the Chinese Sun Oil Company in Shenzhen, established in 1984, has also come online.

Chen indicated that the corporation has 3 years of consecutive growth in production value, revenues, and contract payments, and the rate of revenue growth exceeds that of production value and crude oil processing volume. Compared to the 1982 level, the growth is 5.3 percent in crude oil processing, 29.3 percent in industrial value of production, and 39.97 percent in revenue.

9698/13045
CSO: 4013/54

BREAKTHROUGH IN OIL EXPLOITATION TECHNOLOGY REPORTED

Beijing JINGJI RIBAO in Chinese 11 Jan 86 p 2

[Article: "New Breakthrough in Oil Exploitation Technology; Thick Oil Thermal Extraction Technology Passes State Appraisal"]

[Text] "Thick oil thermal extraction technology"--a key technological project in the state's Sixth 5-Year Plan--passed national level appraisal in the Liaohe Oil Field on 29 December 1985.

Three years ago, enlisted by the Ministry of Petroleum Industry, the Liaohe, Karamay, and Shengli oil fields and the Beijing Oil Exploration and Development Research Institute accepted this key project. Thick oil is petroleum which has a very high viscosity and is very difficult to extract. Thick oil thermal extraction utilizes the thermal sensitivity of thick oil to inject into the oil layer a layer of high temperature, high pressure, heated oil to lower the viscosity of the thick oil so it can be extracted. Liaohe and Shengli thick oil is buried much deeper than similar deposits abroad, and thus it was very difficult to conquer this technological project. For the past 3 years, all the technical personnel of the units attacking this problem have absorbed and expanded imported foreign technology, and worked out a practical thick oil thermal extraction technology suited to China's circumstances and the Liaohe and Shengli oil fields.

The national appraisal committee believed that this thick oil thermal extraction technology has already achieved the level of the early eighties abroad, and some projects have achieved advanced international levels. A thick oil production base has been formed in several oil fields including Liaohe, Xinjiang, and Shengli. The responsible comrades from the Ministry of Petroleum Industry who participated in the appraisal said that the thick oil extraction technology breakthrough is a very important stabilizing factor in China's petroleum production during the Seventh 5-Year Plan period.

8226/13045
CSO: 4013/81

ZHONGYUAN OIL FIELD BECOMES MAJOR PRODUCER

OW120806 Beijing XINHUA in English 0729 GMT 12 Mar 86

[Text] Zhengzhou, 12 Mar (XINHUA)--After 3 years of construction and technical renovation, the Zhongyuan oil field has become one of the major Chinese oil producers, an oil field official said here today.

It is now the fifth-largest oil producer in China, turning out 38.5 million bbl of crude oil last year.

Science and technology, cooperation among different organizations, and import of foreign advanced equipment are the keys to success, the official said.

In the past 3 years, the oil field has discovered a new reserve of 2,100 million bbl of oil and 25 billion cubic meters of gas.

The oil field, covering an area of 5,300 square km, remains one of China's major energy projects in the near future. It is located on the borders of Henan and Shandong provinces.

But its complicated geological structure makes it difficult to prospect and exploit.

In 1983, the State Council decided to speed up the development of the oil field, and since then, about 50 colleges, universities, scientific research institutes, and enterprises have participated in its construction.

Among the 510 research or renovation items connected with the project which have achieved satisfactory results, one won a state award for invention, six won state awards for scientific advances, and 117 have made major breakthroughs, according to the official.

Since 1982, American, French, and West German experts have worked in the oil field. They have provided seismic prospecting, well logging, and drilling services.

Now, the oil field has completed five drilling sections and laid pipelines to Luoyang, Kaifeng, Anyang, and Tangyin in Henan Province and Cangzhou in Hebei Province.

/7358
CSO: 4010/40

OIL AND GAS

MPI FOCUSES ON NATURAL GAS EXPLOITATION

HK120441 Beijing CHINA DAILY in English 12 Mar 86 p 2

[Excerpts] The Ministry of Petroleum Industry is to introduce a new program to increase the exploitation of natural gas resources, the newspaper ECONOMIC INFORMATION reports.

The country has been slow to develop the industry. By the end of last year, the industry's annual production was some 12 billion cubic metres, 16th highest in the world.

According to a plan drawn up by the ministry, natural gas will become one of the country's important energy resources by the turn of the century.

During the Seventh Five-Year Plan (1986-1990), the ministry's aim is to increase the volume of proven natural gas deposits by 810 billion cubic metres.

Gas production in Sichuan Province, in northern China and in the Yinggehai Basin of the South China Sea will be increased, and two other gas-producing areas, in the northeastern and Shaanxi-Gansu-Ningxia border regions, will be commercially developed.

The ministry also plans to adopt the following measures:

--Establish special research institutes and organizations to explore and develop natural gas.

--Separate gas prospecting from petroleum prospecting. An independent system adapted to gas will be established.

--Earmark special development funds for natural gas exploration.

/7358
CSO: 4010/40

ANOTHER PEARL RIVER MOUTH BASIN OIL, GAS STRIKE REPORTED

Hong Kong WEN HUI BAO in Chinese 25 Jan 86 p 12

[Article by staff reporter Li Chaohui [2621 2600 6540]]

[Text] Chen Tongtai [7115 6894 0669], general manager of the Nanhai East Oil Corporation, said today that the ACT operations group recently sank another high-yield evaluation well, Huizhou 21-1-2, in the eastern part of the Zhujiang [Pearl] River Mouth Basin in the South China Sea. So far, the corporation has found four oil- and gas-bearing structures in the Zhujiang River Mouth Basin and discovered industrial oil flow in six wells.

The Huizhou 21-1-2 well is located in Contract Area 16/08 in the basin, about 274 kilometers to the southeast of Guangzhou City. Tests have been conducted at four levels in the well. A total daily yield of 9,350 barrels of crude oil and 136,000 cubic meters of associated gas is obtained from three oil layers, and the oil is of good quality. The remaining layer has a daily yield of 380,000 cubic meters of natural gas and 133.5 cubic meters of condensate. This is the second high-yield oil and gas well drilled in the Huizhou 21-1 Structure, and the ninth producing well drilled since cooperative prospecting for oil by China and foreign companies began in the Zhujiang River Mouth Basin. Earlier a high-yield industrial oil flow was discovered in the Huizhou 33-1-1 Structure.

Chen said that the Xijiang 24-1 Structure, whose evaluation was completed this year, also contains good oil- and gas-bearing formations. It is about 7 kilometers away from the Xijiang 24-3 Structure, where a high-yield oil flow has been found. Its oil source is the same as the Xijiang 24-3 Structure, but its oil-bearing layer is different. This indicates that it is possible to find oil in other structures in the same zone. It also shows that the oil and gas resources in the Zhujiang River Mouth Basin are characterized by their distribution over entire zones, which further proves that we have found the first rich oil and gas area in the Zhujiang River Mouth Basin.

The Nanhai East Oil Corporation began to sign its first group of contracts in May 1983. By the end of 1985, the corporation had drilled 30 wells, of which 27 had been completed, in the 8 contract areas offered in the first round of bidding, and carried out a 21,000-kilometer seismic linear survey, completing nearly 110,000 meters of drilling footage and spending a total of about $350 million.

12802/9365
CSO: 4013/69

LIAOHE OIL FIELD'S GROWING OUTPUT

Shenyang LIAONING RIBAO in Chinese 3 Feb 86 p 2

[Article by Zhang Shirong [1728 0013 2837] and Sun Yuqi [1327 3842 3823]: "Liaohe Oil Field Today"]

[Text] The Fourth Largest Oil Field

The Liaohe Oilfield is China's fourth largest oil field, ranking after the Daqing, Shengli, and North China oil fields.

Located in southwestern Liaoning Province, it borders on the Bohai Sea in the south, Shenyang in the north, Liao He in the east, and Lushan Mountain in the west. Surrounded by the five cities of Shenyang, Anshan, Jinzhou, Yingkou, and Liaoyang, it stretches through nine counties including Panshan, Dawa, Liaozhong, Taian, Xinmin, and so forth. The Liao He and Daling River pass through this area to enter the sea, and the Shen-Shan and Gou-Hai railways run southward through it. Liaohe oil field's command center is located in Panjin City. The oil field's prospecting and development area covers 12,000 square kilometers. It consists of 11 oil districts including the Xinglongtai, Huanxiling, Ciyutuo, Shuguang, and other districts, and employs more than 80,000 workers and staff members. There are a great number of drilling derricks as well as endless stretches of rice fields in this area, where new oil towns have arisen amid a land of fish and rice.

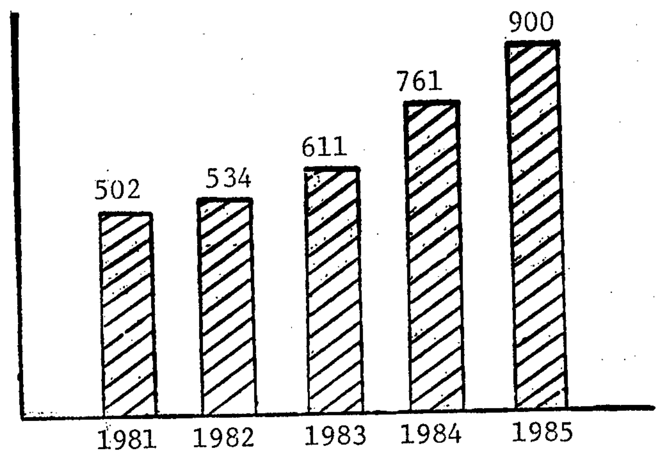
Premier Zhou Gave Orders

After more than 10 years of general survey in the Panjin area, the prospecting team dispatched by the Ministry of Geology finally discovered the Rehetai and other oil-bearing structures in 1955. In March 1967, a Daqing survey team again went down the Liao He and discovered the Huangjindai, Ganlou, Xinglongtai, and other oil fields which showed impressive oil-bearing prospects. In early 1970, Premier Zhou signed the State Council order on developing the Liaohe oil field. Soon, tens of thousands of "iron men" gathered at Panjin, as a mighty army of oil workers marched to Liaohe. They set up camps on reed marshes and drilled wells in the bog, raising the curtain on the first great battle for oil in China in the 1970's. In 1980, the Liaohe oil field was officially announced in the newspapers with an annual output of 5 million tons of crude oil for that year.

An Annual Crude Oil Output of 9 Million Tons

Liaohe oil field's output has been increasing at a rate of 1 million tons each year. Last year it produced 9 million tons of crude oil. The oil field has also been able to increase output, output value, and funds turned over to the state simultaneously and set new records in the process. What is even more encouraging is the fact that newly discovered oil reserves in the Liaohe oil field have been increasing at an average annual rate of 14 percent, which is higher than the 12-percent average annual increase in its crude oil production, thus laying a reliable material foundation for the oil field's crude oil output to increase continuously during the Seventh 5-Year Plan period.

Unit: 10,000 tons



More Than 4,000 Scientific and Technical Personnel

In the past few years, the Liaohe oil field has stepped up technological imports and transformation and brought about fairly rapid development in science and technology. It employs more than 4,000 scientists and technicians and is equipped with more than 900 well-cementation, well-logging, fracturing, and other special-purpose machines and more than 100 pieces of micro-equipment. With a strong scientific and technical force, it is marching forward toward the goals of the Seventh 5-Year Plan.

How Many More Years of Development?

Although the Liaohe oil field has been opened up for 15 years, it has only just entered its youthful period. There are still new oil-bearing formations even in the developed sections of the oil field. New oil-bearing areas and layers with oil reserves totaling 100 million tons have been discovered on the old oil field. The Shenyang oil field with a proven reserve of 200 million tons is waiting to be exploited and can be developed into a large oil field with an annual output of 3 million tons. There are also vast reserves on the periphery of the Liaohe Basin: the Kailu Basin in Nei Monggol, the Fuxin and Zhangwu Basins in Liaoning, and the 80,000 square kilometers of prospecting

area under the shallow sea off the Liaodong Peninsula. It can be said that the present situation is gratifying, and that the future is bright.

Encouragement From Hu Yaobang

Since 1984, Hu Yaobang, Zhao Ziyang, and other central leading comrades have inspected the Liaohe oil field one after another. Comrade Hu Yaobang urged the masses of workers and staff members to "continue to forge ahead and strive to become the third largest oil producer." Filled with confidence, the workers and staff members of the Liaohe oil field are now marching courageously forward toward that goal.

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PROBLEMS AFFECTING DECISIONS ON PETROLEUM EXPLORATION PROBED

Beijing SHIYOU KANTAN YU KAIFA [PETROLEUM EXPLORATION AND DEVELOPMENT] in Chinese Vol 12, No 5, 1985, pp 71-76

[Article by Shi Xunzhi [0670 6064 4249] of the Ministry of Petroleum Industry Science and Technology Department: "A Discussion of Certain Policy Questions on Oil and Gas Exploration in China"]

[Text] Abstract

This article discusses and briefly analyzes policy decision problems in geological exploration for oil and gas in China in seven areas: a correct understanding of petroleum geology characteristics in China, selection of strategic replacement strata positions for oil and gas exploration, regional selection of optimum exploration spheres, strengthened exploration for natural gas, good handling of the relationship between new and old regions, attention to the value of small oil and gas pools and new methods for developing exploration. These questions concern principles of oil and gas exploration and technical policies in China in the short term as well as in the medium and long term. They are related directly to whether or not China will be able to develop oil and gas exploration at a higher rate and with greater results and they should be focused upon and studied.

China has rich oil and gas resources and great potential for development of the petroleum industry. Correct principles of exploration and technical policies, petroleum geology theories integrated with actualities in China, adoption of new technical and strengthened exploration as well as the implementation of scientific enterprise management will make it possible to attain a fairly high rate of growth in oil and gas reserves. Achievement of the goal of doubling oil and gas reserves by 1990 and attaining even higher goals by the year 2000 is completely possible. This makes conscientious summarization of the history of oil and gas exploration in China over the past 35 years, examination of useful experiences in the world and strengthened analytical research on policy decisions for oil and gas exploration an extremely important and urgent question. This article will discuss seven problems in the area of geological exploration and provide some humble opinions for study and discussion.

I. A Correct Understanding of China's Petroleum Geology

China now produces more than 100 million tons of crude oil each year, more than 90 percent of it produced in the eastern region. Exploration and development work also is concentrated mainly in the east. If we wish to achieve further development of oil and gas exploration in the future, is it possible to use all of the distributional regularities of oil and gas pools and petroleum exploration methods in the west and south? This requires a basic understanding of China's petroleum geology characteristics and the distribution of oil and gas in each region before rational application and development of petroleum exploration experiences in eastern China is possible, and we should use new ideas based on the characteristics of new regions to develop new methods. This is an important research topic.

As for China's petroleum geology characteristics, there is no perfect understanding at present. The result is that opinions differ concerning the demarcation of petroliferous regions in China. For example, some use the various types of sedimentary basins as the unit of oil and gas distribution, some use various type of structural basins demarcated by plate structures as the unit of oil and gas distribution, and others divide China into three petroliferous regions, the east, central and west, and so on. The selection of geological theories and concepts of oil and gas distribution as a guiding basis for future exploration work in China, therefore, is an extremely important question in policy decisions. I feel that everyone's opinion can serve as a reference but that we should use the basic characteristics of petroleum geology in China as the foundation and analyze them to select the best and follow them. Some, for example, can serve as a basis for exploration in the east while others can guide the search for petroleum in continental facies basins. The following points should receive attention during the analysis:

1. China has both marine facies sediments and continental facies sediments, and we should search for petroleum in continental facies as well as in marine facies. The oil and gas formed in continental facies sediments is completely dissimilar to oil and gas formed in marine facies sediments in terms of parent material, enviornment and qualities of the oil and gas. This is especially true of the formation and distribution of oil and gas pools formed in continental facies sediments, which are subject to obvious control by continental lake basins. The oil and gas is distributed mainly around the perimeter of oil generating depressions and has its own special characteristics. These two major types of oil and gas pools, therefore, have different characteristics and regularities in their formation and distribution. The geological theories of petroleum in continental facies oil and gas pools as well as the distributional regularities of the oil and gas cannot be applied totally in the search for oil in marine facies.

2. There are rather substantial differences in the structural development and the structural and sedimentation characteristics of the Chinese continent before and after the Mesozoic era. During the Paleozoic, it basically was affected by the three main Pacific Ocean, Indian Ocean and Siberian plates and has a history of the development of a continental crust in an ocean

and trench region of an ancient continental nucleus (the ancient Tarim, North China and South China continents). After the Mesozoic, however, it basically involved further development on the foundation of a continental crust (the Tethys Sea also was found in the southwest). Under the influence of the westward subduction of the Pacific Ocean Plate and the northward compression of the Indian Ocean Plate, extension occurred in the continental crust in the east and formed a series of rifts. The continental crust thickened in the west, however, and formed a large compressional basin. Although structural activity after the Mesozoic profoundly transformed the structures formed earlier, it could only play a transformational role for Paleozoic oil and gas pools while being unable to play a role in controlling the formation and distribution of Paleozoic oil and gas pools. We cannot, therefore, use the structural activity and the structures formed after the Mesozoic as a basis for delineating petroliferous regions in China as a whole.

3. There are different characteristics and regularities in the formational environment and distribution of carbonatite and arenaceous rock in marine facies sediments and continental facies sediments. Although several enormous lake basins developed in China during the Tertiary, Cretaceous and other periods, their water body conditions, sedimentary regularities and types of sediments exhibit major differences from those found in the oceans. An example is sand bodies found in lake basins and in the ocean. They have different characteristics in terms of the regularities, spread and structure. The sedimentary regularities of carbonatite in lake basins are much smaller than in the oceans. The Tertiary in China contains many saline lake basins that are completely different from shallow sea tidal areas and lagoonal sediments. For this reason, the theories and regularities of oil and gas reservoir strata in continental facies sediments cannot be used en masse for oil and gas reservoir strata in marine facies sediments. What deserves our attention is that a large amount of low porosity and low permeability reservoir strata and sutured reservoir strata exist in Paleozoic and Mesozoic strata in China. This is a topic deserving of specialized research.

4. The Chinese continent is located at the conjunction of the three Pacific Ocean, Indian Ocean and Siberian plates, and it has seen rather frequent structural activity. This is especially true from the Jurassic on, when the activity was extremely intense. Mantle uplifting or plate activity in many regions (and zones) formed enormous stress forces that caused the sedimentary rock to undergo a history of rather strong pyrometamorphosis. The ground temperature gradient remains fairly high in some regions to the present day. This means that regardless of whether we are speaking of continental facies sediments or marine facies sediments, there are different characteristics in the thermal formation and maturation and the pyrometamorphic history of the organic material and hydrocarbons in the rock of each strata and region. The Cenozoic and Paleozoic are different and the Paleozoic in north China is different from the Paleozoic in Yunnan, Guizhou, and Guangxi. In southwestern China, for example, data on the reflectivity rate (Ro) of lenticular bodies in the strata indicate that strata before the Permian era generally are in a state of over-maturity

or maturity. Obviously, we cannot apply the formational and distributional regularities of Tertiary oil and gas pools in a state of maturity or low maturity in eastern China to guide the search for oil in the southwest.

These problems show that continental facies sediments and marine facies sediments, arenaceous rock systems and carbonatite systems, Mesozoic strata and Paleozoic strata in the eastern and other regions all exhibit their own petroleum geology characteristics. For this reason, the theory of oil generation in continental facies in China and the formational and distributional regularities of oil and gas pools in east China cannot be complete reflections of all the petroleum geology characteristics in China. If we wish to provide better guidance for exploration work in the future, we must strengthen research on the basic characteristics of petroleum geology in China as a whole and in its different regions.

II. What Era's Strata Should Be the Focus of Exploration in China Following Continued Development of Cretaceous and Tertiary Strata

China produces more than 100 million tons of petroleum each year, roughly half from the Cretaceous sytem and half from the Tertiary system. An examination of the distribution of oil-producing regions indicates that Cretaceous strata presently are located mainly in the Songliao Basin, while Tertiary production strata are distributed fairly widely. On a national scale, what strata should be the focus of exploration in the future and what strata can serve as strategic replacement strata in oil and gas exploration? This is another question that deserves serious study. Analysis of current data indicates that the following five strata deserve attention in the near future:

1. The Cretaceous system in the north. Oil pools have been discovered from the Songliao Basin to the Erlian Basin and in the Hexi Corridor and Xinjiang. Predictions are that new large oil and gas pools may be discovered in large Cretaceous sedimentation regions.

2. The Carboniferous system. This is the primary gas-producing strata system in the Sichuan Basin. Oil pools already have been discovered in the Junggar Basin, oil has been found in deep wells in the Tarim Basin, and it is the main producing layer for coal-formed gas in the north China region, so it has very great potential.

3. The Jurassic system in the northwest. This contains oil as well as coal and is one of the primary coal producing strata in China with reserves that account for 40 percent of total coal reserves in China. It is an important target in future exploration for coal-formed gas.

4. The Cambrian system. This has very thick carbonatite sediments as well as quite a bit of dark colored mudstone strata. There are many oil seepages in the north China region and enormous bitumen veins over 10 meters thick have been found in the Longmen Shan region of Sichuan. There is a great deal of carbon bitumen in western Zhejiang. The Cambrian system has a large-scale process of oil and gas formation and it is possible that large oil and gas pools may be found.

5. The Silurian system in the south. This contains graptolite shale facies sediments of great thickness and wide distribution, and is excellent oil generating strata. Industrial gas wells already have been discovered in Guizhou and previously destroyed ancient oil pools have been discovered in Guizhou (Majiang), on both sides of the Leifeng Shan, in Zhejiang and other areas. Residual bitumen reserves may be several tens to hundreds of millions of tons, which indicates that the Silurian system underwent large-scale oil and gas generation.

These strata systems require the development of basic systematic geological research as soon as possible to select favorable regions, evaluate resources, deploy exploration work and strive to make breakthroughs as early as possible. The various producing strata systems in existing oil regions of course should be the target of exploration at present and all of them have very great room to move for development. There also is a substantial possibility that new oil and gas reserves will be added and that new oil and gas pools will be discovered.

III. What Spheres Should Be Selected as a Focus and What Oil and Gas Pools Should Be the Focus of Exploration in Future Search for Oil

There are three new trends in the world at present in the development of oil and gas exploration: The first is development of new regions. Exploration is being carried out in economically underdeveloped regions, in continental and shallow sea areas in cold regions at high latitudes and in deserts, forests, swamps, deep seas and other areas with complex working conditions. The second is to open up new spheres. Examples include searches for non-anticlinal oil and gas pools (concealed oil and gas pools), deep oil and gas pools, oil and gas pools in reverse thrust fault zones, gas pools in dense sandstone, oil and gas pools in non-sedimentary rock and so on. The third is to expand the targets of oil and gas exploration and the development of non-conventional oil and gas resources. Examples include heavy oil and bitumen with a specific gravity greater than 0.95, gas in coal system strata, gas formed through organic causes, gas dissolved in water, gas-bearing water and so on. These new trends indicate the broad and varied qualities of global oil and gas distributions and they have opened up our field of view. To a great extent, however, they reflect the situation and developmental direction in nations with a rather long history of petroleum exploration and a rather high degree of exploration in the world. These of course are very enlightening for us. China, however, has a vast territory, a very broad distribution of sedimentary rock and a low degree of exploration. Not only can we copy the various new spheres of oil and gas exploration in the world today in exploring for oil but we also have great possibilities in searching for oil in relatively easy regions, spheres and types of oil and gas pools. The extent of our oil and gas exploration, therefore, is even more vast than theirs.

In short-term oil and gas exploration, we should continue to make various anticlinal oil and gas pools the primary target of exploration. This is especially true of new regions, new basins and in regions in old areas

with a low degree of exploration, all of which should be the first locus of the search for oil and gas pools. In eastern China, we should strengthen exploration of basic rock oil and gas pools and concealed oil and gas pools in Tertiary sedimentary basins, and we should pay special attention to oil and gas pools in the central portions of the various types of basins. In basins with intermediate land masses like the Junggar Basin, large scale oil and gas distributions often are found in the transitional zone moving from the marginal depressions toward the central uplift and in secondary structures on the central uplift. We should be active in developing new basins including new medium and small scale basins in the east, the primary basins of the west (all of which have a very low degree of exploration), in the thousands of mountainous regions, in the shallow sea continental shelf (especially in Liaodong Bay and the large continental shelf in the East China Sea), and so on. Moreover, we should develop exploration for new oil and gas resources, mainly gas in coal system strata, and deep strata gas in Sichuan, the Ordos Basin and eastern China. As for the search for petroleum in large scale overthrust nappe bodies in China, we first of all should develop geological surveys and carry out intensive geological research. This also is a new realm with excellent prospects in the search for oil and gas.

The selection of realms for oil and gas exploration should be based on the different geological conditions and degree of exploration and give consideration to existing exploration results, and we also should have economic viewpoints. Use comprehensive evaluation to select the best and line them up. This work plays an important role in discoveries of new oil and gas pools and development of new oil and gas regions. Appropriate selection can improve the results of exploration, increase reserves quickly and provide good economic results.

IV. Further Reinforce Exploration for Natural Gas

The understanding and attention given to marine facies sediments in China now is growing daily. Arrangement of the proportional relationship between gas and oil in exploration work is related directly to the question of whether or not it will be possible to strengthen exploration for natural gas. China has abundant natural gas resources and petroleum gas, coal system strata gas and low maturity gas (gas formed by organic factors) in the Neogene and Quaternary. Geological reserves of gas in coal system strata alone amount to 8 to 18 trillion cubic meters. Merely by strengthening natural gas exploration we certainly will be able to achieve good results. For this reason, we should select natural gas exploration targets and adopt effective measures to achieve a faster pace of development.

We should develop exploration for natural gas in the Bohai Gulf region. The Liaohe oil field, Dagang oil field, Shengli oil field, Zhongyuan oil field and others indicate that Tertiary strata have rich natural gas contents. They exist mainly in three states: One type is found when large amounts of fractures formed because of Tertiary structural movements have destroyed primary oil and gas pools and led to a second instance of oil and gas migration and accumulation (usually not a single instance).

For this reason, the natural gas in the fault block oil pools that now have been found exists in forms like gas on top of gas, gas in gas strata in oil pools (independent gas pools), lithologic gas pools and so on. The natural gas pools are rather small and occur in large numbers, and they are mixed in with oil pools to form several oil and gas pools. There are large amounts of this type of gas in the Bohai Gulf region. Another type is deep gas pools that are buried deeply and have excellent preservation conditions, or there may be mudstone or gaoyan strata that serve as capping strata and which often form independent and rather large gas pools. These gas pools contain condensed oil. The third type is low maturity gas in shallow strata. The stratigraphic ages of these are very new and they accumulate in very flat structures or lithologic traps. This is especially true of some new depressions (like the Bozhong depression) that are very deserving of attention and where it is quite possible that large gas pools may be found. Moreover, there also is gas or primary petroleum gas in Paleozoic coal system strata that can be reservoired in old strata or in new strata.

We should strengthen exploration for gas in coal system strata. This is especially true of the Ordos Basin, the southern part of the Songliao Basin, the North China region, western Shanxi, the Qinshui Basin, the Turpan-Hami Basin, the Junggar Basin and other prospective regions with very good prospects and where work should develop quickly. This includes natural gas in some regions with especially important economic value like Beijing-Tianjin-Tangshan, the Jiang-Huai region and the Chuxiong-Simao Basin, where specialized exploration for gas in coal system strata should be done to achieve breakthroughs as early as possible.

The principle of combined work for oil and gas should be employed for development of natural gas. Like oil, natural gas is included in state planes and there should be tasks and indices for both reserves and output. Specialized natural gas survey and exploration deployments as well as specialized natural gas survey and exploration forces are essential for true attainment of the goal of strengthened natural gas exploration.

V. Strive To Develop New Oil and Gas Regions

In old oil and gas regions, oil and gas pools already have been discovered, the geological conditions are rather well known, and there already is a certain amount of knowledge concerning the distributional regularities of oil and gas pools. The focus should be placed on continued exploration and increasing oil and gas reserves. A large-scale increase in oil and gas reserves and the ability to maintain continued growth for a period in the future requires that we rely on the discovery of new large oil and gas pools and the development of new oil and gas regions. In relation to the problems in this area, the oil and gas exploration history of the Soviet Union over the past 30 years is very deserving of our attention. According to research by Comrade Liu Shuxuan [0491 3219 5503] of the Beijing Petroleum Exploration and Development Scientific Research Academy, the great efforts in the Soviet Union during the 1950's to develop the second Baku [oil field] were accompanied by the start of survey exploration of western Siberia.

Discoveries were made during the 1960's, construction was begun during the 1970's and during the early 1980's the western Siberia region alone produced 334 million tons of petroleum and 176.1 billion cubic meters of natural gas. In conjunction with concentrated development of western Siberia, survey exploration of the Diman Baykal Basin was undertaken in the 1960's and discoveries were made in the 1970's. More than 50 oil pools now have been found and industrial oil and gas regions account for 30 percent of the entire prospective region. In addition, more than 20 Protozeroic to Cambrian system oil and gas pools were discovered in eastern Siberia during the 1970's. Survey exploration of the Baltic Sea and the Sea of Okhotsk also began in the 1980's. The continual opening of new oil and gas regions has provided reliable guarantees for substantial increases in oil and gas reserves in the Soviet Union. The discovery of the large oil and gas regions in western Siberia did not cause them to relax their development of other new oil and gas regions. This is a very valuable experience.

The history of oil and gas exploration in China is similar. The discovery of the Karamay, Daqing, Shengli, Renqiu and other oil pools resulted in obvious increases in reserves and output. The opening up of the Bohai Gulf oil and gas region has guaranteed that oil and gas reserves and output in China over the past decade and longer have been maintained at 100 million tons per year and that there has been some increase each year. Moreover, we must rely on the gulf in the near future to make a great effort. The most effective measures for a substantial increase in oil and gas reserves in China, therefore, are to study the formational conditions and distributional regularities of large oil and gas fields and to open up new basins and new oil regions. The opening up of the Zhongyuan oil pool is a moving example. It has been predicted that the Erlian Basin also will play a similar role. We should, therefore, make great efforts in the future to strengthen survey and exploration work in new regions, increase the proportion of work done in new regions and make early preparations for new replacement regions.

VI. The Value of Small Oil and Gas Pools

Small oil and gas pools generally make up most of the pools within a particular petroliferous basin, usually accounting for about 30 to 60 percent of total reserves. This is especially true after exploration in a petroliferous basin has passed the stage of high maturity, when this part of the reserves gradually come to occupy the primary position. For this reason, the development of small oil and gas pools is an inevitable trend in the development of each oil and gas region. Such reserves now account for about 20 percent of proven reserves in many basins in eastern China at the present time. This proportion may increase in the future.

The development of small oil and gas pools, especially the development of small and complex oil and gas pools, is more difficult than in large and medium sized oil and gas pools. With appropriate methods, however, excellent results still can be achieved. In the Federal Republic of Germany, for example, there now are 123 producing oil and gas pools. All

of them are small but complex oil and gas pools of the salt dome, fractured anticline, stratigraphic, lithologic and other types, and they produce 4.25 million tons each year. Only nine of them produce more than 100,000 tons annually and the largest oil pool produces 540,000 tons each year. The method they employed was to explore and go into production as soon as they were discovered. Different types of oil pools are treated differently. Each of the complex oil pools is handled in blocks, combining production and exploration, with continual development. In development, there is decentralized management with self-formed systems. The capacity of the oil pools themselves is utilized fully and oil extraction techniques are employed in a flexible manner. Technologies for primary, secondary and tertiary oil extraction coexist within a single oil field. Some of the blocks depend on gushers, some use water for development, and others use thermal extraction and chemical oil recovery. The oil, gas, water and condensed oil that are extracted from underground are separated completely and the useful components in the oil, gas and water like sulfur, salt and heat are utilized fully. In technical equipment, the approach is not one in which the most modern is the best but instead involves adaptation to local conditions, with economical utilization and extraction by the optimum technique. In management, the focus is on the technical qualities of work personnel, simple structures, small workforces and high efficiency. The use of this set of methods has meant that, regardless of the small size and complexity of the oil and gas pools and the fact that the water content of many of them is over 90 percent, the economic results still are rather good.

Although an oil pool may be complex, it can be divided up, treated differently and handled in blocks. This makes each block rather simple. Although an oil pool may be small, several of them added together become larger, so small oil pools also can play a major role. If, therefore, we focus on a set of exploration and development technologies and management methods that have rather high economic results, it is entirely possible that reserves in these oil and gas pools can be developed and utilized in the short term. This is a very real question for the old oil regions and the medium and small scale basins that will be opened up in eastern China in the future. For this reason, we should adopt the best models as soon as possible and use experimentation to facilitate the formulation of technical policies and establish a set of exploration and petroleum techniques for small oil and gas pools adapted to China's characteristics.

VII. Study and Develop Exploration Methods

Adoption of new technical equipment without a doubt is the basic measure for the development of oil and gas exploration. If, however, we readopt scientific exploration methods we will be able to replay a role redoubled in strength. The discovery of the Daqing oil field involved the adoption of regional exploration methods, comprehensive utilization of geological, geophysical, drilling and other techniques and integration of regional large profiling and parameter wells (basic standard wells), and the method of making secondary structures the targets, overall deployment and the

development of exploratory drilling. This led to the rapid discovery and proof of the Daqing oil field. Such a set of methods also was effective in the development of the Bohai Gulf oil region. During the 1970's, foreign countries suggested coordinated exploration and the Ministry of Petroleum Industry recently proposed rolling exploration of fault block oil pools. The summarization and study of these exploration methods and the establishment of new methods play an important role in increasing the speed and success of exploration. Today, almost 25 years have passed since the discovery of the enormous Daqing oil field. We have explored and developed many new regions and many basins have a rather high degree of exploration. We have a rather complete understanding of the distribution of petroleum in basins and we have accumulated rich experience in exploration. We should make a comprehensive summarization of the history of exploration in China over the past 25 years, do an intensive dissection of examples of exploration in some of the basins and oil fields and systematically establish a set of new exploration methods.

In looking back on and summarizing exploration in eastern China, it appears that the targets of exploration for oil and gas in sedimentary basins should be the basins. We should do three dimensional seismic sampling and systematically control the entire underground space in the basins. From the bedrock to the Quaternary, from sandstone to carbonatite and from anticlinal traps to stratigraphic and lithologic traps, all types of oil and gas pools, generation, reservoiring, capping, entrapment, protection and other basic petroleum geology questions should be included within the scope of survey exploration to set up systems engineering for oil and gas exploration in a basin. Afterwards, there should be a specific procedure to determine the overall situation of oil and gas content throughout the basin and prove the various oil and gas pools. Exploration for oil and gas in a basin cannot involve a decision concerning what to search for on the basis of the types of oil and gas pools that have been discovered. When another type of oil and gas is discovered, that type should be sought out again. Moreover, some traditional work methods in exploration work should be abandoned. An example is preliminary evaluation of the test oil from key exploratory wells. We should use formation testers and usually should test all effective reservoir strata. This is different from the traditional methods in which tests are done only when they are interpreted as being oil strata as revealed through logging or electric logging. In this manner, the engineering necessary for strengthening exploration can be adopted to accelerate the pace of exploration and improve the success in exploration.

China's petroleum industry has entered a new period of development. To obtain an even higher speed of development and even greater economic results in the future, we now face many major policy decision analyses. This is extremely important work. This article only suggests certain problems in the area of geological exploration. The goal is to offer a few commonplace remarks by way of introduction so that others may come up with valuable opinions and to encourage even more discussion and research.

References

1. Wang Shangwen [3769 1424 2429] et al., ZHONGGUO SHIYOU DIZHIXUE [Petroleum Geology in China], Petroleum Industry Press, 1983.

2. Zhang Wenzhao [1728 2429 2507], "Formational Regularities of Oil Pools in the Continental Facies Basins of China," SHIYOU XUEBAO [Journal of Petroleum], Vol 4, No 3, 1983.

3. Zhu Xia [2612 1115], "Mesozoic and Cenozoic Oil and Gas Basins," GOUZAO DIZHIXU JINZHAN [Progress in Structural Geology], Science Press, 1982.

4. Zhang Kai [1728 1956] et al, "Demarcation and Prospects of Petroliferous Basins in China," SHIYOU XUEBAO, Vol 1, No 4, 1980.

5. Li Desheng [2621 1795 3932], "Structural Types in the Petroliferous Basins of China," SHIYOU XUEBAO, Vol 3, No 3, 1982.

6. Zhu Xia, "A Discussion of Ancient Global Structures and Paleozoic Oil and Gas Basins," SHIYOU YU TIANRANQI DIZHI [Petroleum and Natural Gas Geology], Vol 4, No 1, 1983.

7. Chen Fajing [7115 4099 2529], "Types of Sedimentary Structures and the Distribution of Oil and Gas in Tertiary Petroliferous Basins in China," DIZHI XUEBAO [Journal of Geology], Vol 54, No 3, 1980.

8. Guan Shicong [7070 1102 5115], "A Discussion of Marine Sedimentary Environments From the Late Paleozoic to Permian Eras in China," SHIYOU YU TIANRANQI DIZHI, Vol 1, No 1, 1980.

9. Dai Jinxing [2071 6855 2502], "Preliminary Research on the Gas-Bearing Qualities of Coal System Strata in China," SHIYOU XUEBAO, Vol 1, No 4, 1980.

10. Guan Shicong et al., "Analysis of the Prospects for Petroleum and Natural Gas Resources in China," SHIYOU YU TIANRANQI DIZHI, Vol 4, No 1, 1981.

11. Weng Wenbo [5040 2429 3134], "The Development of Comprehensive Exploration," SHIYOU XUEBAO, Vol 1, No 1.

Postscript

This issue contains Comrade Shi Xunzhi's article "A Discussion of Certain Policy Questions of Oil and Gas Exploration in China." The article suggests various factors in seven areas that should be considered in policy decisions on oil and gas exploration development plans in China. It outlines the main characteristics of petroleum geology in China and suggests exploration countermeasures for regional replacement and strata position replacement. We feel that the views in this article are beneficial for organizing production, formulating plans, planning and guiding research. We welcome our vast readership to discuss various questions in it to derive policy decisions on deployments with real value.

12539/9604

CSO: 4013/28

CAS, PETROLEUM SECTOR COOPERATION YIELDS RESULTS

Beijing JINGJI RIBAO in Chinese 28 Jan 86 p 1

[Article: "CAS and Petroleum Sector Gain Considerable Results by Jointly Takling Key Problems--The Economic Benefits from a New Oil Pumping Shaft May Be Counted in the 100 Millions If Used Nationwide"]

[Text] In accordance with the principle of using advantages to make up for shortcomings, striving to cooperate, bearing risks jointly, sharing in achievements together and so on, the CAS and large enterprises under the Ministry of Petroleum have developed long-term comprehensive scientific and technical cooperation and made good progress after 3 years of practice.

In October 1982, the CAS and Ministry of Petroleum Industry jointly convened a scientific and technical cooperation work conference and signed an agreement to develop long-term comprehensive S&T cooperation. Based on the principle formulated bilaterally of using advantages to make up for shortcomings, striving to cooperate, bearing risks jointly, sharing in achievements together and so on, the two sides have developed cooperative research on 180 S&T topics in 25 areas. Most of these topics concern problems in technical progress in the petroleum industry that require urgent solutions and they also include applied and basic research concerning future development. The key topics among them are: intensified oil extraction techniques (also called tertiary oil extraction), corrosion and wear-resistant metallic materials, oilfield chemistry, large-scale electronic computer development, comprehensive evaluations of the petroleum geology of basins and depressions, petroleum and natural gas exploration, drilling engineering and other projects.

Some of the scientific research achievements have received technical authentication over the past 3 years and now are being used in production. Important stage achievements have been made in a large number of topics. In the areas of applied basic research, they have issued more than 100 scholarly reports.

Examples include the use of chemical methods to intensify oil extraction technologies. Production experiments on tertiary oil extraction now are being carried out at the Dagang Oilfield. Development of the K-grade oil pumping shaft now has attained advanced international levels, and it now is in no way inferior to international product levels in component analysis, amount of inclusion and other areas.

Well tests have proven that its useful life may be increased by several dozen times. Several days or more than ten days of use require one replacement of the oil pumping shaft at a cost of about 10,000 yuan per change. The newly developed oil pumping shaft has continued to work for more than 40 days without breakdown. Economic benefits of 500,000 yuan already have been gained from its use in three test wells. If all the oil wells in China proceeded from reality and adopted new types of corrosion resistant and wear resistant oil pumping shafts, the economic benefits could be counted in the 100's of millions [of yuan]. During cooperation, two new types of pump valve materials were developed successfully, and after the pump valves are developed, their useful life could be raised 2-fold or more.

Development of high level S&T cooperation between the multidisciplinary, comprehensively superior CAS and the technologically-intensive petroleum industry system is advantageous for the discovery, identification and solution of problems in major S&T issues. The large-scale computer for oil and gas exploration and intensified oil extraction that is capable of 20 million operations was jointly developed and has been included as a key state project during the Seventh Five-Year Plan.

12539/12223
CSO: 4013/85

FRANCE, CHINA SAID TO CLINCH DEAL ON DAYA BAY

HK130755 Hong Kong SOUTH CHINA MORNING POST in English 13 Mar 86 p 12

[Article by Albert Chan]

[Text] Guangzhou: Knotty and protracted negotiations between France and China finally ended yesterday when a deal was clinched for the supply of equipment for the Daya Bay nuclear plant.

Framatome, which will supply two 900-megawatt nuclear reactors to the plant, signed a letter of intent with Guangdong Nuclear Power Joint Venture Co. (GNPJVC) after intense negotiations over the U.S. $700 million (HK $5.46 billion) deal in Shenzhen.

Another French public utility firm, Electrie de France (EDF), also signed similar documents with the Chinese for the HK $27 billion plant's overall engineering design work.

The British GEC group, which is still trying to sell conventional power generators to China, has been unable to reach an agreement due to "some outstanding difficulties" with the Chinese, said GNPJVC spokesman Chen Heling last night.

He was unable to say when--or if--the two sides could iron out their differences.

"We hope an agreement can be reached as soon as possible, but it will have to depend on the British attitude," he said.

GEC has been lagging behind the French in the Daya bay negotiations, which have been going on for 5 years.

There were suggestions that the British firm was thinking of pulling out late last year when negotiations reportedly broke down.

Sir Jack Cater, Hong Kong's former chief secretary, heads the GNPJVC team in negotiations with the British.

It is believed that Sir Jack will be signing the letter of intent on behalf of GNPJVC if the two sides eventually come to terms.

Commenting on yesterday's signing ceremony, Mr Chen said the two sets of documents meant an accord had been reached on technological aspects, financial arrangements, and pricing as well as other sales conditions.

Mr Zan Yunlong, who heads the Chinese team in negotiations with Framatome, signed the letter of intent with Mr D. Degot, a director of the French firm, while Mr Pan Yansheng, general manager of GNPJVC, signed the EDF document.

With the letters of intent concluded, the mammoth contract will be submitted to the Chinese and French governments for official approval before formal contracts can be signed.

It is expected that official approval will be ready in 5 to 6 months, after which full-scale construction of the plant will begin.

/9599
CSO: 4010/41

SITE FOR PROPOSED 2000 MW SUNAN PLANT SELECTED

Shanghai JIEFANG RIBAO in Chinese 14 Nov 85 p 1

[Article by Reporter He Wannan [6320 1354 3948]: "Sunan Will Build a Large Nuclear Power Plant--Another Measure To Reinforce the East China Grid--the Plant Site Will Be at Changshan in Jiangyin County, 120 kilometers From Shanghai"]

[Text] This reporter has learned from the East China Power Management Bureau that the power-short East China region will build a large nuclear power station--the Sunan Nuclear Power Plant.

The site of the Sunan Nuclear Power Plant, which will be built using equipment and manufacturing techniques imported from foreign countries, will be in the Changshan region of Jiangyin County, 120 kilometers from Shanghai, 150 kilometers from Nanjing and an average of 42 kilometers from Changzhou, Wuxi, and Nantong. The nuclear power station will be located in the load center of the East China Grid. It has a firm stone block structure that can serve as the foundation for the nuclear reactor, and it has rather good conditions in the areas of geology, earthquakes, environmental protection, size of the site, communications and transportation and so on. In addition, it can draw water directly from the Chang Jiang. The nuclear power station has a planned installed capacity of two 1 million kW nuclear power generators and will generate a total of 13.3 billion kWh of electricity after it goes into operation. Total sales of power will be 15 billion kWh, equal to 18 percent of the amount of power generated in the East China Grid during 1985, and it may create more than 60 billion yuan in value of industrial and agricultural output.

To strengthen leadership over this key project, the Ministry of Water Resources and Electric Power has approved the establishment of the Sunan Nuclear Power Development Company. The overall design will be done within China by the East China Electric Power Design Academy. The Shanghai Nuclear Industry Research and Design Academy will be responsible for design of the nuclear island. The Ministry of Water Resources and Electric Power has entrusted leadership to the East China Grid, the Jiangsu Provincial Electric Power Bureau will organize construction management and the Wangting Power Plant will organize transmission and production personnel.

Bearing in mind the advantages of nuclear power and everyone's concern for safety questions, this reporter visited senior engineer Zhou Qiusen [0719 4428 2773] of the East China Power Management Bureau. He told me that nuclear power has many advantages in comparison with thermal power. Using two 1 million kW nuclear power generators as an example, unit coal consumption for thermal power would be 63.5 million tons and would involve a great deal of shipping. A nuclear power station, however, uses only about 40 tons of nuclear fuel each year and involves an extremely small amount of shipping. A thermal power plant would discharge 1.6 million tons of ash and cinders each year as well as large amounts of sulfur dioxide and other toxic gases that would pollute the environment. A nuclear power plant discharges no ash or cinders and no sulfur dioxide. Nuclear power is a new energy resource, and the best use for U-235 is power generation. Petroleum and coal, in contrast, are raw materials used in the chemical industry and should be used comprehensively. In terms of economic results, estimates are that the cost of electricity from the Sunan Nuclear Power Plant will be 4 to 6 percent lower than the Baogang Power Plant. The advantages of nuclear power in comparison with thermal power are obvious.

As for the question of safety which concerns everyone so much, Zhou Qiusen told me that the yearly radiation dosage of personnel working in a nuclear power plant is equivalent to just one X-ray. The effects on residents living near the nuclear power station would be even smaller, less than 1 millirem a year, while a person receives 4 millirems on a single flight from Shanghai to Beijing. The nuclear reactor pile could not explode like an atomic bomb since the U-235 concentration in the raw material of a nuclear bomb is over 90 percent while the U-235 content in a nuclear reactor is only 3 to 4 percent. This can be compared to pure alcohol, which will burn, while beer with an alcohol content of only 4 percent will not burn. There now are 25 countries in the world that have built 344 nuclear power stations, and not a single person has been killed to date.

12539/12223
CSO: 4013/85

DISPOSAL OF RADIOACTIVE WASTE FROM PWR REACTOR

Beijing DIANLI JISHU [ELECTRIC POWER] in Chinese No 12, 5 Dec 85 pp 69-73

[Article by Tang Zongyan [0781 1350 3508], Science and Technology Information Institute, Ministry of Water Resources and Electric Power: "PWR Nuclear Power Stations: Handling of Radioactive Wastes From a PWR Reactor and Impact of Radioactive Discharge on the Environment"]

[Text] I. Handling of Radioactive Wastes

The fuel uranium used in PWR is uranium ore which is extracted from underground and which, after a complex process of sorting, refining, chemical conversion, enriching, and processing, is manufactured into fuel elements. This processing of nuclear fuel before placing it in the reactor is generally termed "preprocessing." After "burning" in the reactor, the uranium fuel should be "postprocessed" to recover uranium which has not been fully consumed and the plutonium which is produced and also to extract some fission products and transuranium elements. The entire process from extraction of the uranium ore to the recovery of radioactive nuclear elements in the spent fuel is called "fuel recycling." Radioactive wastes are produced at each stage. This paper is a brief introduction to the handling of radioactive wastes produced only in the operation process of a PWR power plant.

The large quantity of radioactive material produced by nuclear fission in the operation of a nuclear power station is the main source of a nuclear power plant's radioactivity. Neutron capture reactions also form a certain quantity of transuranium elements and activated products of the structural materials. When the fuel element casing is damaged, some fission products can enter the coolant. After the structural part of the reactor has undergone corrosion or damage, activated products of the structural materials also can enter the coolant. In addition, when impurities in the coolant pass the reactor core, they can also become radioactive due to neutron radiation.

It is necessary strictly to collect, handle and control radioactive wastes produced during operations in the nuclear power plant to prevent radioactive materials which exceed the maximum allowable concentration from being discharged into the surrounding environment. For this reason, radioactive waste collection and handling systems have been established.

1. Source and Handling of Radioactive Gases

Below we explain the source and handling methods of the waste gases produced during ordinary operations.

(1) Exhaust gases from volume control tanks and other equipment

The gases used in a circuit of a PWR nuclear power plant include hydrogen gas, which is added to the coolant to inhibit corrosion, and nitrogen gas, which is used as a cover gas in the water tanks. The hydrogen is added to the volume control tanks to maintain the hydrogen concentration in the coolant. In the gas in the volume control tanks and the water tanks, the hydrogen or nitrogen mix with the radioactive gases given off by the reactor coolant. Thus the gas which is replaced and expelled in the volume control tank during starting and stopping the reactor and the cover gas which is expelled as the water level rises in the water tanks during operation both are waste gases which are radioactive. In addition, gases are expelled when the boron recovery equipment is operating. These gases are stored in the gas decay tank for a certain period of time so that the short-life krypton, xenon, and iodine isotopes in the waste gas drops more than 99.9 percent, then they are either expelled or reused, depending on the strength of the radioactivity and composition of the gas.

Recently, hydrogen recombination or separation devices have been installed in some PWR power plants. The hydrogen recombination device is made up of a preheater, catalytic reactor, cooler and water separator. The waste gases containing hydrogen which are expelled from the gas space in the volume control tank are forced into the catalytic converter by the waste gas compressor and with the introduction of appropriate amounts of oxygen and the reaction with the surface of the catalyst turns it into water and steam which thus reduces the concentration of hydrogen. The water in the gas mixture is eliminated through the cooler and the water separator. The remaining gas is transported from the recombination device to the hydrogen recombined gas decay tank and then returned to the compressor inlet where it completes the cycle. Within the cycle, after the remaining concentration of hydrogen bearing waste gas has reached a low level, it is sent to the waste gas decay tank.

The exhaust gases of these devices go through exhaust gas collector tubes and are sent by the waste gas compressor to the gas decay tank for storage. For example, when the coolant is drawn off to adjust the iodine concentration and due to heat expansion in the cooling system is sent to the holding tank, the waste gases expelled in the gas space of the holding tank enters the exhaust gas collection tube as waste gas.

If the radioactive gas stored in the gas decay tank is largely nitrogen and the oxygen concentration in the gas is below the limit, this gas can be reused as a cover gas in the holding tank; if it exceeds the limit, then it is held for a certain period of time before discharge.

(2) Reactor safety shell ventilation

If the cycling coolant within the reactor's containment shell leaks, radioactive material will contaminate the ventilation. In addition, some of the Ar-40 in the air is converted into Ar-41 through neutron radiation around the reactor container. Therefore, when workers enter the containment shell after the reactor stops the air must be changed by containment shell ventilation and air conditioning equipment. After the air has been changed, the expelled gases first go through containment shell air cleaning equipment, and the radioactive grains and iodine eliminated from the air by particle filters and iodine filters, then it is expelled by an exhaust fan through the containment shell stack.

If the containment shell pressure rises to near a designated value during operation of the reactor, it is necessary to exhaust a small amount of air through radioactive ray control room exhaust gas filtering equipment made up of particle filters and iodine filters to reduce pressure.

(3) Reactor auxiliary building ventilation

If the cycling coolant in the reactor's auxiliary buildings leaks, some radioactive material will contaminate the air. Auxiliary room and safety auxiliary room ventilation exhaust ordinarily is expelled after the auxiliary building exhaust filter equipment (microparticle filter) eliminates radioactive microparticles. Ventilation exhaust of the waste fuel holding pool is expelled after the fuel storage exhaust filter equipment (microparticle filters) eliminates radioactive microparticles.

When any waste gas is released its concentration of radioactive matter is monitored by the gas monitor and is expelled from the stacks in diluted form.

2. Sources and Treatment of Radioactive Waste Liquids

The following types of waste liquids are produced during normal operation:

(1) Water drawn to regulate boron concentration of circulating coolant is taken to the holding tank.

(2) Coolant drain-off from the containment shell and the auxiliary buildings is taken to the containment shell coolant drain-off tank and the auxiliary buildings coolant drain-off tank.

(3) Depending on water quality, the drainage water of auxiliary building equipment is taken to the A waste fluid storage tank, B waste fluid storage tank or auxiliary building equipment shu drainage tank.

(4) The containment shell surface drainage and the auxiliary buildings surface drainage is collected in the containment shell catchment pond and the auxiliary buildings catchment pond.

(5) Chemical drainage from the chemical room is taken by the chemical drainage tank.

(6) Washing drainage, i.e., laundry drainage, washroom drainage and bathing drainage, is taken by the washing drainage tank.

There are four handling systems in the waste water handling equipment: boron recovery system, A waste water treatment system, B waste water treatment system, and washing drainage treatment system. Each type of waste water is handled by one of these systems.

Water drawn off from the circulating coolant and drainage from the containment shell and auxiliary buildings coolant is treated by the boron recovery system to separate the boric acid from pure water. This system consists of the boron recovery intake ionic exchanger, coolant storage tank, boron recovery equipment, boron ion removal exchange, boric acid concentrate tank, and monitor. After the waste liquid has been cleaned of ionized matter by the ion exchanger and stored in the coolant storage tank, the boron recovery degassing column of the boron recovery equipment separates the soluble gases (the separated gases are treated as waste gases). The soluble solid matter concentrations in the degassed coolant are separated by the evaporator in the boron recovery equipment. After going through the boron ion exchange, the condensation obtained by the evaporator is reused as recharging water for the reactor. The concentrated liquid is reused to recharge the boric acid solution. Before use it must be chemically tested to check if it conforms to reuse standards.

Water from the drainage of the auxiliary buildings equipment which is of low conductivity and high purity (A waste liquids) is treated by the A waste liquid treatment system. Waste liquid is first stored in the A waste liquid storage tank, then the soluble solid matter concentrations are separated by the waste liquid evaporation equipment. After the condensate obtained by evaporation has gone through the ion exchange to improve its purity, in principle it can be reused as recharging water. After curing, the concentrated waste liquid is treated as solid waste.

B waste liquids, containment shell and auxiliary building surface drainage in the shu drainage from auxiliary building equipment is processed by the B waste liquid treatment system. The treatment steps in the B waste liquid treatment system are similar to those in the A waste liquid treatment system. The only difference is that the condensate obtained by evaporation is not recovered, but is sent to the condensate tank through the ion exchanger, and after determining here that the radioactivity is low it is diluted with the condenser coolant and discharged through the drainage outlet. After curing by the barrel packing equipment, the concentrated waste liquid is treated as solid waste.

Laundry drainage in principle is treated by the laundry drainage treatment system. The soluble radioactive material in the waste water is separated by the laundry drainage treatment equipment, the condensate (or shentoushui

[2334 6631 3055] obtained through evaporation is sent to the laundry drainage monitoring trough and after making sure that the radioactivity is very low, it is diluted with condensate coolant and drained through the drainage outlet. The concentrated waste liquid is sent to the barrel packing equipment and treated as solid waste.

3. Sources and Treatment of Radioactive Solid Waste

Most radioactive waste produced by nuclear power stations is ultimately concentrated into solid waste. This solid waste is of medium and low radioactive level in the entire fuel cycle and after 300-500 years in storage can reach a harmless level. Most countries use land storage as the method for permanent disposal, i.e., an area which is geologically stable and has a low water table is selected for construction of a permanent waste dump collecting the solid waste of many nuclear power stations for permanent storage. Many abandoned mines, such as salt mines, limestone mines, and gypsum mines can be used as waste dumps. Many coastal countries use marine dumping as a permanent disposal method, i.e., tightly sealed solid waste is dumped into the deep sea where it is geologically and hydrologically stable. In recent years, marine dumping of radioactive wastes has come to be opposed by more and more people.

Before final disposal, solid wastes are stored in waste dumps inside the power station. The processing methods used are: curing in barrels in cement or asphalt or compacted by such methods as incineration, compression, crushing, dissolution.

The types of solid waste and the methods for solid waste treatment are as follows:

(1) The concentrated waste liquid from the waste liquid evaporation equipment and laundry drainage processing equipment is piped to the loading equipment which loads it into cement or asphalt curing barrels.

The strong acids in the chemical drainage are loaded into cement curing barrels by the loading equipment.

(2) The waste resins from the ion exchanger are piped to the waste resin tank for storage after being stored temporarily in the waste resin tank. The water used for piping is supplied by the reactor water supply tank. After the waste resins have been in the storage tank for approximately one year, have decayed to low radioactivity, they are sent to the loading equipment and loaded into barrels after the water has been extracted. The water which has been extracted can be recycled and must not be discharged.

(3) Miscellaneous solid waste, such as cloth, paper, and small tools, is generally treated by the compression method, that is, the crusher compacts crushable solid wastes into barrels to reduce bulk. Where there is incineration equipment, combustible solid waste and waste oil can be incinerated, and the ash and used and damaged ceramic filter cores packed into barrels after being crushed.

Miscellaneous solid wastes which cannot be compressed are sealed in barrels or cans depending on size and degree of contamination or measures such as binding to prevent the spread of the contamination are adopted.

(4) Used liquid filters are bound to prevent radioactive matter from scattering.

II. Impact of Radioactive Matter on the Environment

In the operation of a nuclear power plant it is unavoidable that some radioactive matter is released into the surrounding environment, just the same as thermoelectric power plants or other production processes cannot help but release some pollutants. However, nuclear power plant design can keep the radioactive discharge much lower than the degree to which they will influence the health of residents. In fact, radioactive discharge from nuclear power plants is unusually low, even to the point of being very hard to detect.

Now, nuclear power plant radioactive waste liquid discharge is limited to a level at which the residents in the surrounding area receive a dosage of no more than 3 mrem annually. Gas discharges are limited to a dosage of no more than 5 mrem received by a hypothetical man sitting on the boundary fence for 24 hours a day for a 365-day year and dosage no greater than 1 mrem received by residents in the vicinity of the power station. Compared with this dosage, the natural background radiation is 100-150 mrem (fluctuation of 20-30 mrem) annually, and the medical radiation received annually is 70-80 mrem. Thus, the increased dosage of radioactivity received by residents in the vicinity of a nuclear power plant due to the plant's radioactive discharge is less than 1 percent of the dosage they receive from natural radioactive sources. Actually, the radioactive dosage received from a nuclear power plant is less than the variation in natural background radiation. The dosage received by people who live a certain distance from a power plant should be much smaller. From this it is clear that the comparison of the environmental dosage created by nuclear power plants and the environmental dosage created by other radioactive sources with natural background radiation is insignificant.

Since 1958, nuclear power plants world-wide have accumulated over 3,000 reactor/years of operating experience, and there has never been a fatal accident caused by radioactivity. This is because in nuclear power plant design, the most harmful accident scenarios are used as the basis of design. The typical worst-case scenario is: the largest pipe which most threatens the safety of the power plant suddenly is thoroughly ruptured, and the safety safeguard systems and safety injection systems cannot function normally leading to a massive loss of coolant and the creation of a meltdown of the reactor core. The frequency of such incidents is 10^{-5}-10^{-6}/reactor year, which is unusually small.

If all the engineered safety measures to prevent such an accident fail completely and a reactor fuel element meltdown occurs, the containment shell

and safety sprinkler system still can limit the range and impact of the accident's aftereffects. However, at this time the containment shell will release a certain amount of radioactive matter into the surrounding environment. At this time there are still final protective measures to safeguard the environment and the physical health of the nearby residents, and this is the plant's isolation region.

According to estimates of the U.S. Nuclear Regulatory Commission, 98 percent of the reactor core meltdowns could not cause clear human fatalities. The number of average fatalities per reactor core meltdown is 10, and the most serious reactor core meltdown (worst case-scenario) may cause 3,500 fatalities. As stated above, up to the present there has not been an accident in which release of radioactive material from a nuclear power plant has caused a fatality. But historically, personal accidents related to energy sources have always occurred. For example, in 1952, due to severe atmospheric pollution from burning coal, 3,500 persons in London died within several days, and in terms of the number of fatalities, this was equivalent to one yet-to-occur worst case scenario of a nuclear power plant.

Up to now, the biggest nuclear power plant accident in the world was the nuclear power plant accident at Three Mile Island in the U.S. on 28 March 1979. As was mentioned in the fourth lecture, the influence on human health of the radioactivity released was very small.

From the above discussion one can draw the conclusion that during normal operation of a nuclear power the radioactive dosage on the environment is minute, and the frequency of accidental radioactive discharges which endanger life safety is also extraordinarily small. Actually, the impact of nuclear power plants on the environment is much less than coal-burning power plants.

References

1. "Genshiryoku Hatsudensho ni okeru Hoshasei Haikimono no Shori," [Treatment of Radioactive Wastes from Nuclear Power Plants] KARYOKU GENSHIRYOKU HATSUDEN [thermal and atomic generating], Mar 1979.

2. E.S. Pedersen, "Nuclear Power, Vol 1, Nuclear Power Plant Design" 1978.

3. J.J. Duderstadt, "Nuclear Power," 1979.

4. Economic and Technical Experience of Nuclear Power Production in the United States, IAEA-CN1-42/81, 1982.

5. Du Shenghua [2629 5110 5478] et al., HEDIANZHAN [NUCLEAR POWER PLANTS], 1982.

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NUCLEAR POWER

BRIEFS

QINSHAN UPDATE--By the end of this year, the major buildings and main equipment will be in place at the first Chinese-designed nuclear power plant at Qinshan, Zhejiang Province. The 300,000-kW plant will have a pressurized-water reactor, radioactive shielding facilities, and emergency cooling and waste water disposal systems. The Qinshan plant is located in an uninhabited coastal area 92 km from the provincial capital of Hangzhou and 126 km from Shanghai. [Excerpt] [Beijing XINHUA in English 0655 GMT 18 Mar 86] /9599

CSO: 4010/41

SUPPLEMENTAL SOURCES

SOLAR, WIND ENERGY UTILIZATION R&D REVIEWED

Chongqing XIN NENG YUAN [NEW ENERGY SOURCES] in Chinese Vol 8, No 5, Jan 85 pp 1-3

[Article by Wang Buxuan [3769 5943 1357] of the Chongqing University Institute of Thermal Energy Engineering and Thermophysics and Lu Weide [7120 4850 1795] of the Beijing Institute of Solar Energy: "The Situation in Development and Research on Solar and Wind Energy Utilization in China"]

[Text] Abstract

This article outlines China's energy resource strategy, points out the position of solar and wind energy utilization in development of the national economy, describes the current situation in development and research on solar and wind energy utilization and outlines future prospects.

I. Preface

Energy is a global strategic issue. Development of renewable energy resource utilization is an indisputable requirement for adaption to the future. The reason is not merely that existing clean hydrocarbon compounds and even all reserves of natural gas eventually may be consumed completely. Also important is the fact that carbon dioxide produced by the burning of the carbon in fossil fuels may create an extremely troublesome atmospheric pollution problem.[1] However, most nations would rather adopt an energy resource strategy of lowest cost to pursue economic growth, so fossil fuel technologies will continue to rule in world energy resource supply models for a rather long time to come.[2] There is no doubt that petroleum has made an indelible contribution to the enormous progress achieved in the developed nations, but its relative status in future energy resource supply and demand models will decline gradually.

A Chinese government report to the U.N. New and Renewable Energy Resource Conference held in Nairobi, Kenya in August 1981 pointed out that every major shift in energy resource utilization throughout history has taken several decades or even longer to complete. With this understanding, the government of China has been working to assist and encourage research and demonstration work concerning development and utilization of new and

renewable energy resources, including solar and wind energy, and it views solar and wind energy as renewable energy resources that should be treated as supplementary energy resources, not substitute energy resources, at the present time.

International energy circles have acknowledged China's rich energy resource mineral reserves: third place in coal in the world, seventh place in extractable petroleum, 16th place in natural gas and first place in hydropower. Despite China's considerable efforts over the past 30-plus years to develop fuel motive power and its world-famous achievements in energy resource production, the rate of development has not been able to satisfy the urgent needs of development of the national economy. The current plan standard is to double energy resource output by the year 2000. This is quite inadequate to meet the needs of quadrupling the gross value of industrial and agricultural output. Efficiency of energy resource utilization and development in China at present is quite backward when compared with the developed nations. This fact clearly illustrates that China must combine energy resource development and conservation and should strive to develop and utilize all useable energy resources in a diversified manner.

II. The Necessity for Developing Solar and Wind Energy Utilization in China

China has made new advances in solar and wind energy utilization in recent years. The primary focus of debate now concerns ways of making rational evaluations of the economic results of solar and wind energy utilization and how they should be developed in the future.

Many things make the development of solar and wind energy utilization in China essential. The determining factors among them are the technical situation and economic considerations of solar and wind energy utilization, and heed also should be taken of the supply situation for conventional energy resources, actual demand for energy resources and the resource conditions of solar and wind energy.

China has a rural population of 800 million. Total local consumption of energy resources in rural areas in 1979 was equivalent to 327 million tons of standard coal, 38 percent of total energy resource consumption in China during that samw year. Household uses accounted for 80 percent of these 327 million tons of energy resources. Development of farm and sideline production and continual improvements in rural living standards in recent years have led to a sharp increase in rural energy demand. If we use the current rate of development of energy resource production as a guide, it will be quite difficult to provide rural areas with sufficient amounts of conventional energy resources for a substantial period into the future. The main path to a solution of the rural energy resource shortage is to develop and utilize local renewable energy resources, including 3
solar energy and wind energy. China is rich in solar energy resources. The total amount of solar radiation received each year in most areas of China exceeds 585,100 joules per square centimeter (140 kilocalories per square centimeter). The amount of solar radiation received each year in

Xizang, Qinghai, and Gansu almost equals that in places with the most intense sunshine like India and Pakistan. With the exception of certain provinces and regions to the south of the Chang Jiang, the average amount of sunshine per year exceeds 2,200 hours and the maximum can reach 3,200 to 3,400 hours in southern Xizang. Regions with rich solar energy resources often are economically backward places with shortages of conventional energy resource supplies. This gives substantial importance to development and utilization of solar energy in these regions as a means of developing these areas. In places like the Qinghai-Xinzang Plateau, loess plateaus, pastoral grasslands, mountains and islands where there are coal and electricity shortages and poor communications, solar and wind energy not only are a valuable supplementary energy resource but also are actually a reliable energy resource.[4, 5] Because of specific natural conditions and limitations in financial resources and engineering technologies, it is hard to imagine that the hydropower resources of Xinzang and the coal reserves of Qinghai will be developed and used economically within the near future.

III. The Current Situation in Solar and Wind Energy Utilization in China

Generally speaking, solar and wind energy utilization in China at present mainly is in the stage of preliminary technical development, but an excellent and positive foundation has been laid for the future. The economic value of some technologies and equipment and facilities for using solar and wind energy has been revealed through actual use.

1. Utilization of the heat in solar energy

Greenhouses are the first step in this area. China has had a total area of more than 100,000 mu of greenhouses that have been in use for several years to raise vegetables and as heated pens for animal husbandry. They have undergone rapid extension and expansion recently to improve cereal grain and cotton output. These experiences have led us gradually to the successful path of integration with national conditions to develop plastic [film] agriculture.

The second thing is solar water heaters. The total area of solar collectors now in place exceeds 250,000 square meters. They provide hot water for 5 to 8 months each year in most areas of China and can operate year-round in some regions.

In northwest China, more than 20,000 cement shell parabolic light collecting solar stoves are being substituted for traditional straw-burning stoves. The solar stoves now being popularized may provide excellent economic results in areas where total yearly solar radiation exceeds 500 kilocalories per square centimeter.[6] According to estimates, a single family using a solar stove in the northwest could conserve about 2,000 jin of straw each year. The people of the region already have come to consider solar stoves an indispensable part of their daily lives.

In addition, several tens of sets of equipment like solar energy drying systems for heating and drying farm and sideline products, solar energy seawater distillers,[7] solar energy welding equipment and so on have been tested and appraised. In addition, several solar heated swimming pools and solar furnaces capable of reaching temperatures of 3,000°C for use in research on the hardening of material surfaces have been built.[8,9]

All of the achievements described above will provide valuable experience for future development of solar energy heat utilization.

2. Applications of Solar Energy Photoelectric Cells

China began developing solar energy photoelectric technologies in the early 1970's and used its own methods for successful development of monocrystalline silicon solar cells. More than ten enterprises now are manufacturing monocrystalline silicon solar cells and output in 1983 reached 70 to 80 kw with a photoelectric efficiency of 9 to 12 percent. Because of their high cost, utilization of solar cells at present is limited to those used for supplying power in frontier regions not served by power grids. The Xingang lighthouse in Tianjin and automatic signalling equipment at Qinghai's Ketu Railway Station, for example, are powered by solar cells. In recent years, more than 20 railway stations have installed over 30 sets of railway signalling systems powered by solar cells. Lighthouses with a total power of 3 kw have been built along the southeast coast and on the Xisha [Paracel] Islands. Electric fences are another area where economic benefits are possible through use of solar powered photoelectric equipment. Several 100 electric fences on the Nei Monggol grasslands powered by solar photoelectric cells now are in operation and the total capacity exceeds 2 kw.

Many new types of solar cells like multicrystalline cells, cadmium sulfide/iron sulfide membrane cells, non-crystalline silicon cells and so on now are undergoing research and development.

3. Organic energy conversion

To improve the natural environment and restore ecological balance, the government of China has called on the nation to take up afforestation. In addition, we also are trying to extend and accelerate the pace of research on rapid growing forests and in planting early maturing and high output crops in swampy areas and mountain valleys to provide rural areas with their daily fuel needs. This actually is utilization of solar energy stored in organic matter and we are searching for energy resource crops with a future for biological conversion.

4. Wind energy utilization

The broad interest in wind energy utilization that has pervaded Chinese society since the 1970's now has been implemented in the form of certain research and development plans. Medium and small wind powered turbines have been installed on plateaus, grasslands, southeastern coastal regions and some islands. Conversion systems for development and utilization of wind energy include vertical axis medium-sized wind turbines[10] matched with variable speed generators[11] that now are in operation.

A great deal of work to improve sailing junks and increase their navigational capabilities now is in progress.

IV. Long-Term Prospects

Although progress has been made in many different forms of solar and wind energy utilization, China still is at the beginning stage of technical development. The technologies are far from mature and they cannot compete economically. The equipment is rather expensive and many problems remain to be solved. Nevertheless, we mentioned earlier our practical experiences and the essential nature of developing and using new energy resources and renewable energy resources. It is not hard to imagine that solar and wind energy utilization will have broad developmental prospects in China.

China is a developing nation and 80 percent of its population lives in rural areas. We must devise ways to alleviate the long-term rural energy shortage before we can make faster progress in national modernization. It is exactly for this reason that solar and wind energy will become an important supplementary energy resource that is adapted to decentralized utilization, and it will make special contributions to the development of agriculture, forestry, animal husbandry, sideline production and fishery. To realize this goal, however, we must concentrate on research and development of basic materials and basic parts and we must expand commodity supplies of them.

FOOTNOTES

1. M. Calvin, Proceedings of the 1st U.S.-China Conference on Energy, Resources and Environment, Beijing, 1982.
2. Edward E. David, Jr., ibid.
3. Wang Bingzhong [3769 3521 0022] et al., TAIYANGNENG XUEBAO [Solar Energy Journal], Vol 1, No 2, 1980.
4. Zhu Ruizhao [2612 3843 0340] et al., TAIYANGNENG XUEBAO, Vol 4, No 2, 1983.
5. Wang Buxuan [3769 5943 1357] and Zhang Zhengming [1728 2973 2404], Proceedings of the 1st U.S.-China Conference on Energy, Resources and Environment, 1982.
6. Gao Chongjie [7559 1504 2638], TAIYANGNENG XUEBAO, Vol 5, No 3, 1984.
7. Li Zongnan [2621 1350 2809] et al., TAIYANGNENG XUEBAO, Vol 1, No 1, 1980.
8. Yu Zhongkui [0205 0112 1145] et al., TAIYANGNENG XUEBAO, Vol 1, No 1, 1980.
9. Yu Zhongkui et al., TAIYANGNENG XUEBAO, Vol 5, No 4, 1984.
10. Chen Qimin [7115 0796 3046], Proceedings of the 1st U.S.-China Conference on Energy, Resources and Environment, 1982.
11. Ni Shouyuan [0242 0649 0337] et all., TAIYANGNENG XUEBAO, Vol 5, No 3, 1984.
12. Liao Shaobao [1394 1421 5508], TAIYANGNENG XUEBAO, Vol 2, No 3, 1981.

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